HEATING AND VENTILATING

AUGUST 1929

"—in America's finest buildings" is further evinced by these two majestic structures recently erected in Chicago—both furnished with ILLINOIS HEATING SYSTEMS.

ILLINOIS ENGINEERING COMPANY
ROBT. L. GIFFORD. PRES. INCORPORATED 1900
BRANCHES AND REPRESENTATIVES IN 40 CITIES
CHICAGO

Part of a group of 3-apartment buildings erected around Dante and 89th Streets, Chicago, by John R. O'Connor. All are heated with McQuay Cabinet Radiators.

A Selling and Renting Asset in any Building

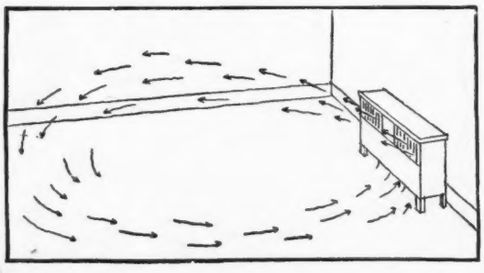
When asked why he selected McQuay Radiators to heat this group of buildings Mr. O'Connor—one of Chicago's foremost developers and builders—replied: **"Because my experience has shown that this radiator is one of the best assets a building can have. The small additional cost means nothing. Every one who sees these radiators, wants them. And this means quicker selling and renting."**

A Complete Radiator

McQUAY Cabinet RADIATOR

Not Just a Cover

The McQuay takes air from near the floor, heats it and then sends it into the room, in a horizontal direction, with sufficient velocity to get it to the farthest points.



Here, at last, is a radiator which adds, rather than detracts from the appearance of rooms. A complete radiator, enclosed in an attractive cabinet of heavy furniture steel which can be painted or enamelled to harmonize with the decorative treatment.

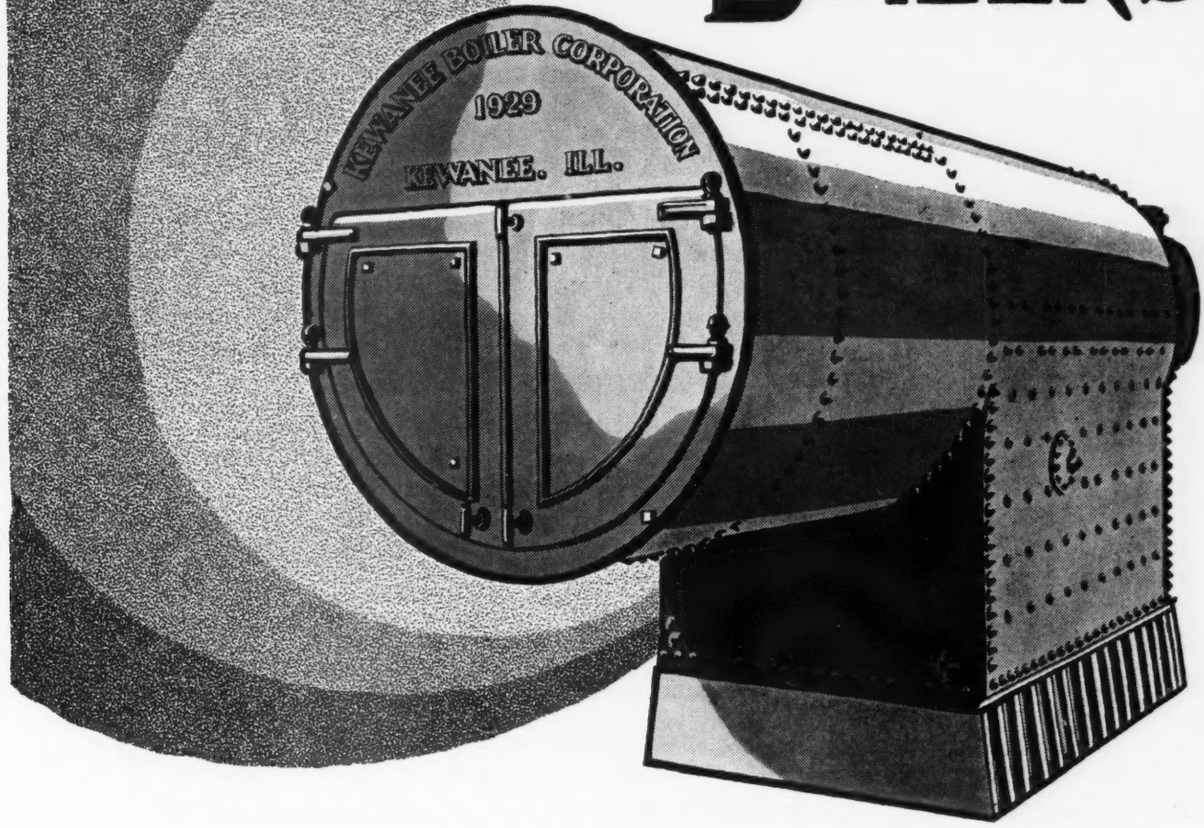
The heating unit of copper has proved extremely efficient. This plus the more complete circulation afforded by McQuay lowers heating costs noticeably.

McQuay Radiators and Unit Heaters are Sold only thru recognized Heating Contractors.

McQUAY RADIATOR CORPORATION General Sales Office: 35 E. Wacker Drive, Chicago

Boston: 10 High Street — Cleveland: 291 E. 149th Street — New York: 2148 Graybar Building
Newark, N. J.: J. F. McLaughlin Co., 738 Broad Street — Pittsburgh: Bushnell Machinery Co., Century Building

KEWANEE STEEL RIVETED BOILERS



In buying a Kewanee you may be sure that the boiler bill is "Paid in Full." For, a Kewanee is a permanent investment that will last as long as the building, and pay dividends, every year, through lower fuel bills and less cost for upkeep.

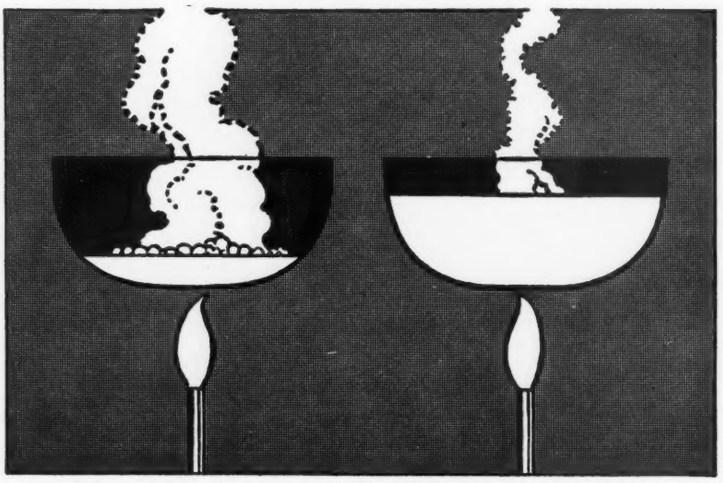
Whatever the circumstances, *don't buy a "cheap" boiler.* Doing so is merely making a "down payment" on the heating equipment. And every year thereafter extra installments are added in the form of bigger coal and repair bills.

Ask for "61 Years of Progress in Steel Boiler Building"

KEWANEE BOILER CORPORATION Kewanee, Illinois
Branches in 40 Principal Cities

HEATING AND VENTILATING, *formerly* THE HEATING AND VENTILATING MAGAZINE, published by NATIONAL TRADE JOURNALS, INC., at 521 Fifth Avenue, New York, N. Y. Subscription rates: United States, $2.00; Canada, $2.50; Foreign, $3.00. Single copies, 30 cents. Vol. XXVI, No. 8, August, 1929. Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879.

Which Will Boil First?



Correct water content, whether in a kitchen vessel or a heating boiler, means quick steaming and economical firing. Pacific boilers, with their correctly proportioned water content, are 20% to 30% quicker on the "getaway" in the morning than other firebox boilers. They save fuel at the time of forced firing when other boilers are wasting it.

At night, when fires are banked, the Pacific's water content is sufficient to continue to supply heat to the radiators for as long a time as a boiler with 50% greater water content. On the other hand, in the morning no fuel is wasted in heating an over-sized water content—heat that is unnecessary.

Owner, tenant, and fireman profit when a Pacific is installed. The owner saves fuel, the tenant is assured of the utmost comfort, the fireman has less firing to do and starts it at a later hour in the morning.

This properly proportioned water content, the high percentage of direct heating surface, and the Pacific's exclusive system of forced circulation give an economy and a flexibility obtainable in no other boiler.

Write for literature on the several types of Pacific installations. There is one to fit your next job.

PACIFIC

STEEL HEATING BOILERS

AND CAPITOL RADIATORS MAKE A LOGICAL COMBINATION

STEEL HEATING BOILERS PACIFIC WAUKEGAN ILLINOIS TRADE MARK REG. U.S. PAT. OFF.

PACIFIC STEEL BOILER CORPORATION

Factories: Waukegan, Ill., Bristol, Pa.

Sales Offices in 58 Cities

Division of United States Radiator Corporation, Detroit

In hospitals

where heat must be sure as well as economical—

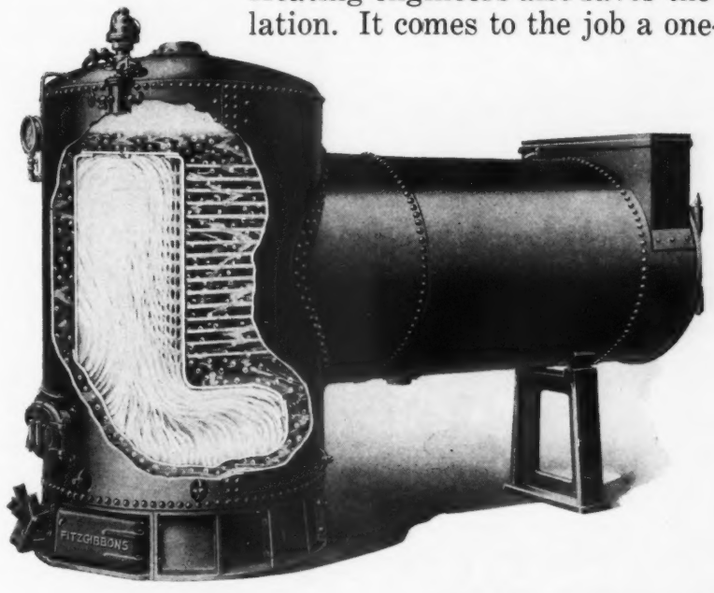
FITZGIBBONS STEEL BOILERS

Hospitals *must* have plenty of heat, and they must have it at as low a cost as possible. The fact that the heating of many of the country's best known hospitals has been entrusted to Fitzgibbons Boilers, reflects the general attitude of heating engineers toward the Fitzgibbons. They know this all-steel boiler can be depended upon to give adequate heat and to keep the fuel bills down.

Fitzgibbons Steel Heating Boilers are built in sizes ranging from 300 to 36,000 sq. ft. radiation. The boiler shown is built for high-pressure loads up to 100 lbs. w. s. p. It is particularly suited to hospitals because it is capable of taking care of the combined heating, kitchen, laundry, sterilizing and hot water loads.

Better combustion, faster and more complete heat transfer, exceptionally rapid "pick-up" of the heating load when starting up, are the chief advantages of the Fitzgibbons Boiler which reduce operating costs, often as much as 40%.

Heating engineers also favor the Fitzgibbons because it simplifies installation. It comes to the job a one-piece unit and requires no brick work. Its *concentrated efficiency also saves valuable space.*



Every heating engineer should have the Fitzgibbons facts handy. A bulletin which gives them in clear, unvarnished terms, will gladly be sent on request. Write for a copy today. Remember also that the Fitzgibbons organization is ready to make boiler recommendations upon receipt of the necessary information. More than 40 years of boiler experience stamp these recommendations with authority. Capitalize on this service.

Branches and Representatives:

Baltimore	Detroit	Philadelphia	San Antonio
Boston	Louisville	Reading	Syracuse
Bridgeport	Pittsburgh	Richmond	Winston-Salem
Buffalo	Pittsfield	Rochester	

FITZGIBBONS BOILER COMPANY
570 SEVENTH AVE. NEW YORK, N. Y.
Works, Oswego, N. Y.

AN OUTSTANDING CONTRIBUTION to GAS HEATING

• SECOND •

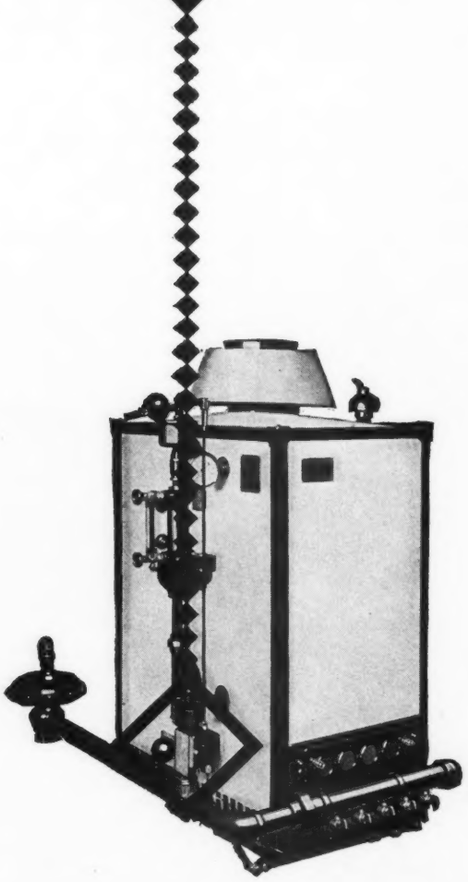
THE THROTTLING VALVE

A PRINCIPLE OF GAS
SUPPLY CONTROL
. . . . DEVELOPED
AND ESTABLISHED
BY THE
GAS UTILIZATION DEPT.
OF THE

AMERICAN RADIATOR COMPANY

FOUND PERFECTED TO HIGHEST EFFICIENCY ON

IDEAL GAS BOILERS



SEND FOR FULL
INFORMATION TO

AMERICAN GAS PRODUCTS CORP.
376 LAFAYETTE STREET . . NEW YORK

The Albert Pike Hotel, Little Rock, Ark.
Eugene John Stern, Architect.
El Dorado Heating & Plumbing Co., Heating Contractors.
Heated by Three 9,000-foot Ross Steel Heating Boilers.

Judge boilers *by these* 10 POINTS of Superiority

1—Unrestricted circulation.

2—Smokeless.

3—Unusually large direct heating surface.

4—Full length self-cleaning convex crown sheet.

5—Tubes easily cleaned from outside.

6—One large body of water.

7—Indestructible smokeless arch with circulating baffles.

8—Large central flue.

9—All seams electrically arc welded—tubes expanded in heads.

10—Three-pass fire travel.

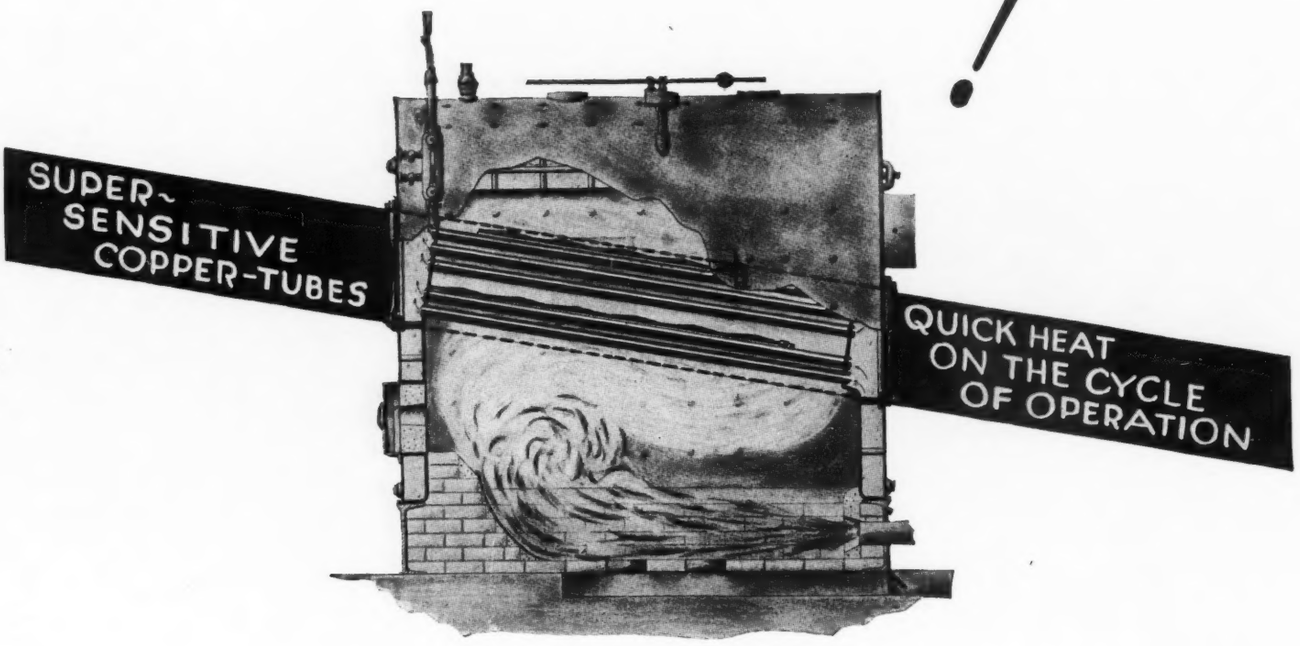
Write for Catalog—Ideal for Oil or Gas Burning.

The Frost
MANUFACTURING COMPANY
Galesburg . Illinois

Dealers in Most Leading Cities.

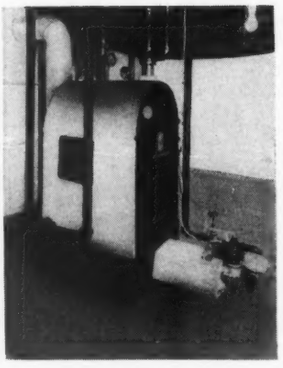
ROSS STEEL BOILERS

for Oil and Gas!



THE KNOWLTON BOILER

With the new and more intensified conditions which must be met in the application of OIL or GAS as a heating medium, comes The Knowlton Oil and Gas Burning Boiler equipped with Super-sensitive Copper Tubes. It has proven itself, due to the copper "Watertoob" construction, far superior in handling Automatic Heating. It gives quick heat on the cycle of flame operation and retains this heat so that the system continues its work efficiently on the cycle of non-operation.



The Knowlton Boiler for Oil or Gas makes a neat, clean, efficient heating unit.

ORR & SEMBOWER, INC.

READING, PENNSYLVANIA

208 N. Clinton St., Chicago 50 Church St., New York

don't sell cast iron

sell Made-to-Measure Warmth

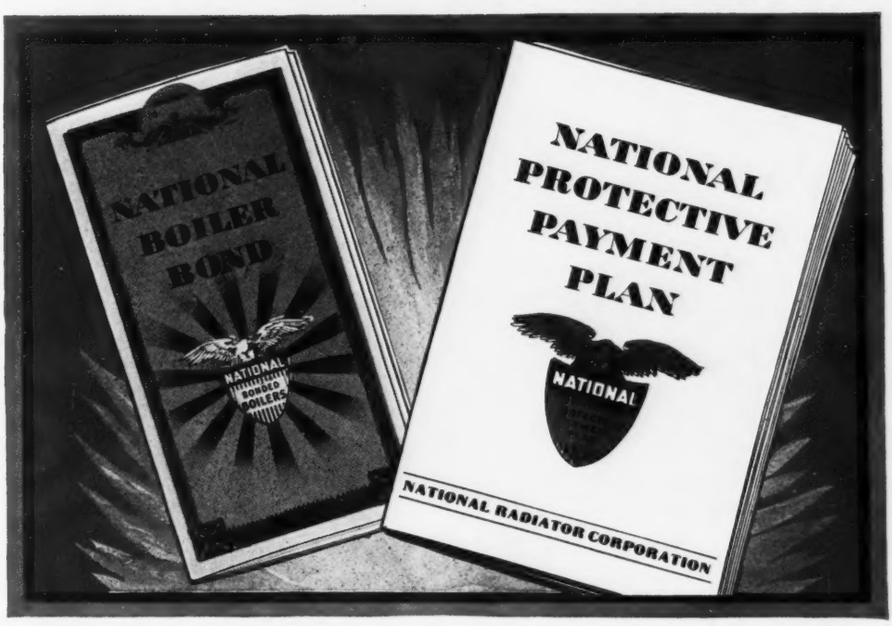
Playroom

Bed Rooms

Grandma's Room

Bath Room

Living Room



NO RED TAPE AND NO RED FIGURES

Two revolutionary steps—the National Boiler Bond and the National Protective Payment Plan—can now supplement and reinforce all your selling effort.

The National Protective Payment Plan lets you offer installment payments. At the same time, you get your money in full when the job is completed. An insurance clause takes care of your customer's payments in case of his death or disability.

This plan reduces risk through poor pay accounts, it causes a higher percentage of profit to be earned on a smaller amount of working capital.

Each National Boiler is guaranteed —and the guarantee endorsed and specifically defined by a Surety Bond issued by The Fidelity and Casualty Company of New York. It covers three distinct guaranteed stipulations as to manufacture, design, performance, and the replacement of defective parts. It assures customer satisfaction, protects you, carries with it the conviction that you are installing material of highest quality and proved dependability.

You can *interest* your prospects with the National *Made-to-Measure* idea by selling *warmth* instead of *cast iron*.

You can *convince* them with the *guaranteed* guarantee—the National Boiler Bond. You'll find the National Protective Payment Plan an effective closer!

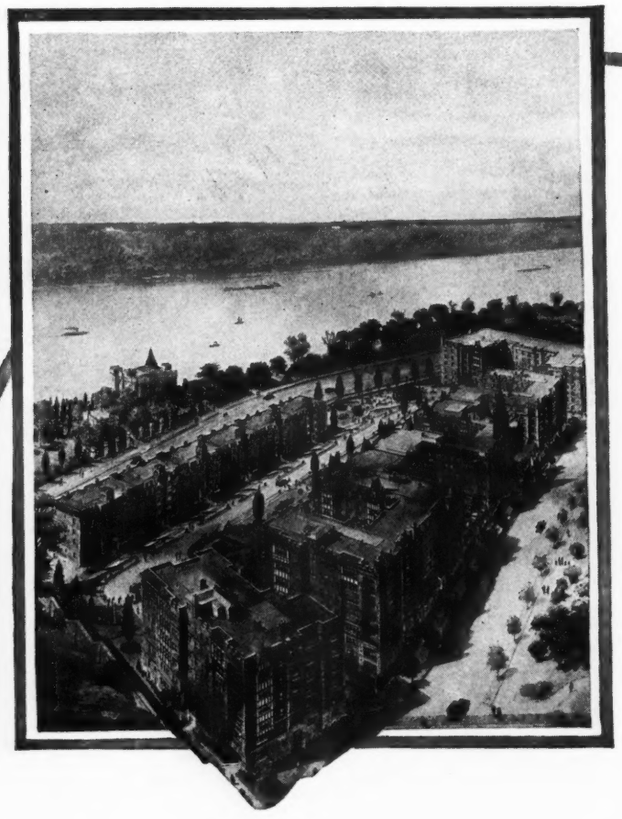
Write for complete and helpful information that will mean better business, bigger profits for you.

NATIONAL RADIATOR CORPORATION

***Executive Offices:* 55 West 42nd Street, New York, N. Y.**

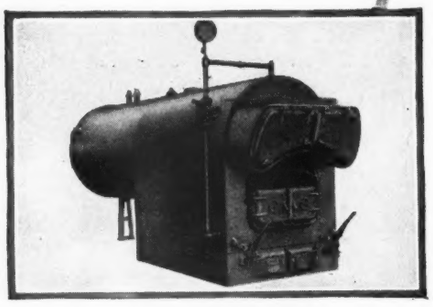
Copyright 1929
National Radiator Corporation

NATIONAL
Made-to-Measure
HEATING SYSTEMS



Hudson View Gardens New York City

Attractive and Comfortable



Series "W" Welded Fire Box Boiler

THE architects who designed this wonderful group not only considered appearance from the standpoint of artistic endeavor but also knew that this must be combined with a never-failing source of heat—thus Titusville Boilers were chosen for this most important task. Their reputation for design, material and workmanship is such that they were preferred above others.

There are scores of other similar installations in all large cities.

THE TITUSVILLE IRON WORKS CO.
Titusville, Pa.

TIW-4

TITUSVILLE

SERIES "W" WELDED FIRE BOX

BOILERS

SIX DISTINCT ADVANTAGES ARE BUILT INTO THIS SELF-CONTAINED DOWN-DRAFT BOILER

1. **Burns any fuel; coal, gas or oil.**
2. **Built to accommodate any type of stoker, gas or oil burner. (Can also be hand fired.)**
3. **Lowest water line of any boiler.**
4. **Easy to clean.**
5. **Custom-built durability (material and workmanship far above ordinary standards or requirements.)**
6. **Specially designed to give unequaled rapidity of circulation.**

The Stanwood Smokeless Boiler is a product that is original with us .... we created it. Then we built it not to a price nor to compare with any other boiler on the market, but to a standard of service which we arbitrarily set and knew from experience would be peak performance.

Oil burners can be applied either through front or rear of furnace. This is a distinct advantage. The internal construction of the Stanwood is so simple and heavy that repairs are negligible. Rapid corrosion is impossible. When these boilers are laid off, they can be completely drained, thus kept dry and free from oxidation.

To get all of the interesting details about this boiler send for Bulletin No. 500. Following are just a few of its unique features: The shell cannot be bagged or burned; neither can its circumferential seams be cracked for nowhere are these surfaces exposed to the fire; the boiler has no fire-box or mudlegs to fill up and corrode; no staybolts to rust or break off; no crown sheet to drop if water is low, or if scale or oil collect on its surface; no internal flue that can collapse.

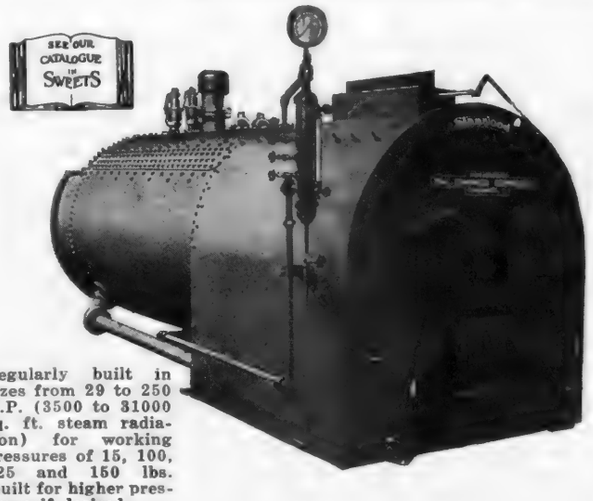
If you are figuring a job that demands the best in boiler service—write us immediately about The Stanwood. Its value is superior to any other. Using the coupon will not entail any obligations, but will afford you with unusually interesting data about an altogether different type boiler .... a custom-made boiler built to assure uninterrupted years of peak performance service. Write today.

ALL STEEL RIVETED CONSTRUCTION

Stanwood *Smokeless* Boilers

THE STANWOOD CORPORATION, Est. 1891, CINCINNATI, OHIO

Also manufacturers of Horizontal Return Tubular Boilers, Stacks, Breechings and Tanks



Regularly built in sizes from 29 to 250 H.P. (3500 to 31000 sq. ft. steam radiation) for working pressures of 15, 100, 125 and 150 lbs. Built for higher pressures if desired.

THE STANWOOD CORPORATION,
Dept. D-89, Cincinnati, Ohio.

Please send complete details about Stanwood Boilers for.....pressure and.....horsepower.

Name.....

Address.....

Firm.....

FISHER BUILDING, Detroit, Michigan
Architect, Albert Kahn . . . *Heating Contractor,* Johnson & Larson

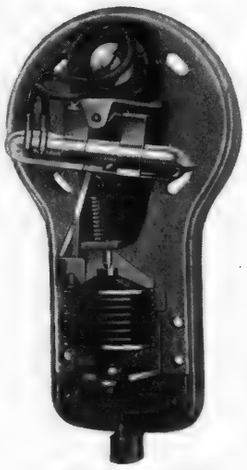
The Unit Heaters in the great Fisher Building Garage are controlled by

47 MERCOID CONTROLS

Every one of the 47 Unit Heaters in the Fisher Building Garage is regulated by a Mercoid Thermostat No. 845.

This is only one of the thousands of installations where Mercoid Thermostats have been selected for Unit Heater Control.

They have shown a great saving in steam and current consumption besides accurately maintaining an even temperature. And it is for these reasons that their use for Unit Heater Control has shown an unprecedented growth. The control is simply installed near the Heater, and by its automatic starting and stopping of the fan, maintains an even temperature.



MERCOID
Thermostat No. 845
with cover removed

For Zone Heating

This same Mercoid Thermostat is also being widely used to regulate the temperature in factories and offices where the direct radiation is zoned. For this work the 845 regulates, according to temperature changes, an Arco Motor Valve installed on the supply mains of each zone. Many heating engineers, with this combination, have been able to effect unbelievable saving in fuel consumption. The saving in a few years more than pays for the cost of equipment.

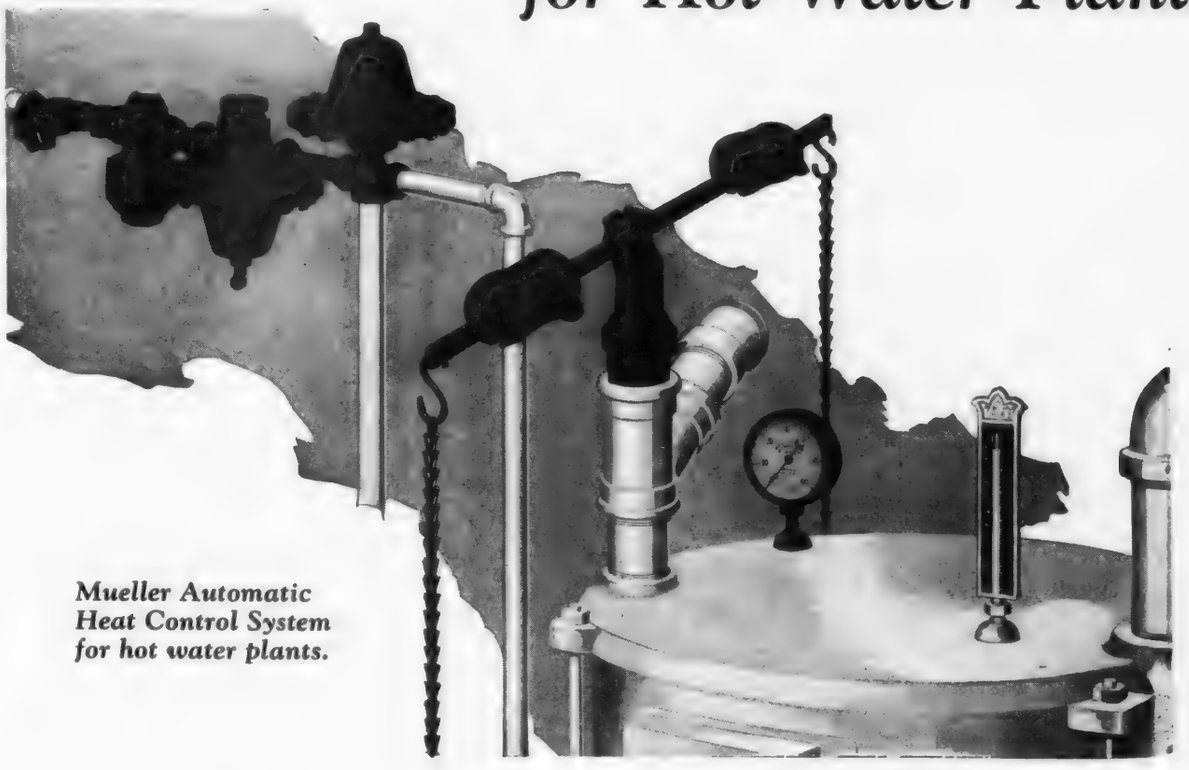
If you do not know about the line of Mercoid controls, write today for complete information and booklet showing over thirty different Mercoid hook-ups on Heating, Oil-Burning, Refrigeration and general industrial work. Complete data and engineering help furnished without the slightest obligation.

AMERICAN RADIATOR COMPANY

Accessories Division
Dept. MHV-3
40 West 40th Street
New York, N. Y.

Two ways to profit!

from Mueller Automatic Heat Control for Hot Water Plants



Mueller Automatic Heat Control System for hot water plants.

Every new, hot water heated house should be equipped with the Mueller Automatic Heat Control. It makes better heating plants that give more heat and burn less coal. Saves trouble, too—water supply and dampers are controlled automatically. It costs the owner no more than an expansion tank and saves you both time and labor on installation.

Old hot water plants in your territory can also be made to pay a profit with the Mueller Automatic Heat Control. Expansion tank replacements are easily made. The increased efficiency of the plant pays the owners and there is a generous margin of profit in it for the contractor. Write for complete information.

MUELLER CO. (Established 1857), Decatur, Illinois; *Branches:* New York, Dallas, San Francisco, Los Angeles; *Canadian Factory:* MUELLER, Limited, Sarnia.

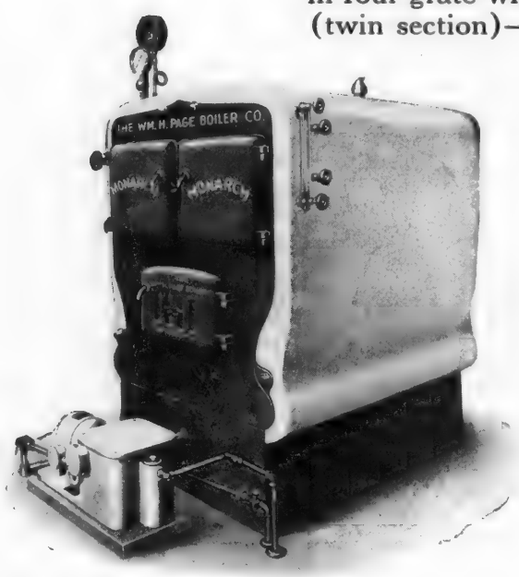
MUELLER

AUTOMATIC HEAT CONTROL SYSTEM

For Oil too

Did you know that Page Monarch Boilers are admirably suited for the economical burning of oil fuel? Many of the foremost men in the oil burner field have turned to Page, as the boiler most perfectly adapted to the conditions surrounding the installation of their burner.

The Monarch Boiler is made in sectional form, in four grate widths— 22″, 28″, 40″ and 60″ (twin section)—and an exceptional range of sizes is offered so that the boiler of width and length best suited to the conditions of burner installation may be selected.



MONARCH STEAM BOILER
EQUIPPED FOR OIL-BURNING

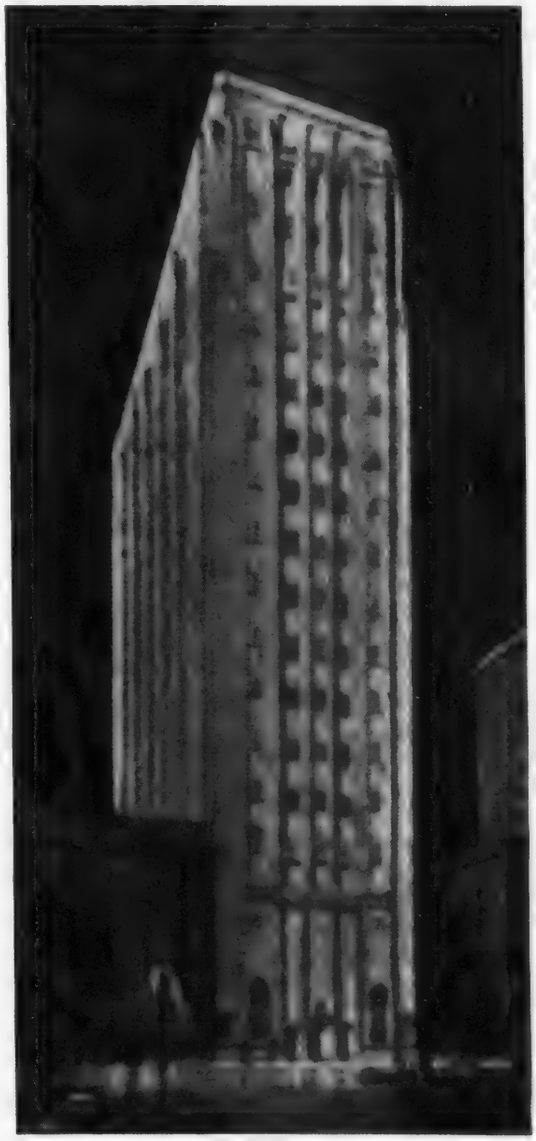
The longer the boiler, the longer the fire travel, of course, but even if a short, square fire box is selected, with the Page a much longer than usual fire travel is obtained, since the gases are carried, through sensitive flue-ways, three times through the boiler, each travel on a different level.

The Wm H Page Boiler Co

General Offices: 200 MADISON AVENUE, NEW YORK CITY

Investigate, and you, too, will recommend the Page for your oil-burner jobs

BOSTON: 123 Beverly Street
CLEVELAND: Rose Building
PHILADELPHIA: 1126 Washington Ave.
Factory: MEADVILLE, Pennsylvania



Chicago Motor Club, Chicago—Hardinge Installation

Another of Chicago's splendid new club buildings equipped with the Hardinge oil burner

Heating and Ventilating engineers can point to prominent buildings in every big city that are being efficiently and economically heated with the Hardinge Fuel Oil Burner. Precision-built in 12 distinct sizes, including a specially priced burner for the small-sized home and apartment, the Hardinge line of fuel oil burners offers a specific model for every heating need from bungalow to skyscraper. You are specifying 10 years of *absolutely guaranteed* oil heating efficiency when you recommend the Hardinge Fuel Oil Burner. Write us for literature fully describing this quiet, economical and completely automatic oil burner.

Hardinge Brothers, Inc.

Factory and General Offices

4149 Ravenswood Avenue
Chicago, Ill.

Electric Ignition Available On All Models If Desirable

HARDINGE
FUEL OIL HEAT

YOU WILL HEAR MUCH

these coming months about

The Improved Challenger

Kleen-Heet

IT is de luxe oil heat—automatic oil heat—for the home of average-size or smaller.

It is very low in cost, *yet is unquestionably the finest automatic oil burner available for this vast market.* And we are not given to making statements of that kind, *without adequate proof*—because we recognize that there are other splendid oil burners on the market.

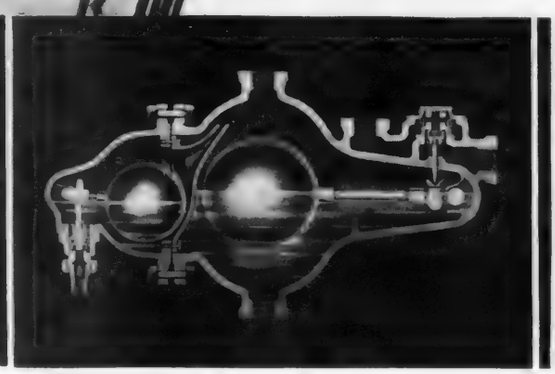
This rates with the greatest burners of all time, on value and performance, regardless of price.

It is, for one thing, absolutely silent—uniquely and completely without sound or vibration!

Complete statement of plans, purposes, and details will be sent to interested dealers who promptly request them. THE WINSLOW BOILER & ENGINEERING COMPANY, 844 Rush St., Chicago.

McALEAR

Water Feeders Positive Automatic Protection for Boilers

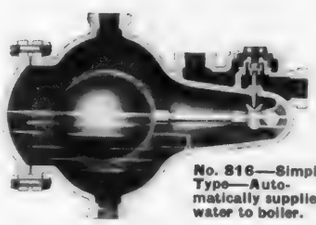


When a man gets thirsty, he takes a drink—but when a boiler gets dry—there's only one answer—cracked sections, burnt out tubes and ruined fire-box.

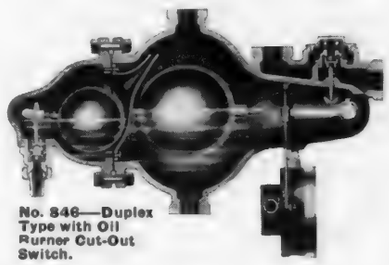
It's mighty poor business to put in a boiler without protecting it with an automatic McAlear Water Feeder. This simple, positive unit automatically maintains the water at the most efficient level in boilers—supplying water as needed and discharging surplus water to the sewer.

It is the only water feeder equipped with frictionless valve which feeds water direct to boiler and eliminates the necessity of rubbing surfaces, springs, levers, etc., so common in ordinary feeders. It never forgets—on the job 24 hours a day—the best insurance you can buy for the safety of a boiler.

Thousands of the largest buildings have their plants protected by McAlear Water Feeders—thousands of smaller installations all over the country operate efficiently under their automatic guidance. It pays. Insist on this protection for your installations.



No. 816—Simplex Type—Automatically supplies water to boiler.



No. 846—Duplex Type with Oil Burner Cut-Out Switch.

Write for Complete Information.

THE McALEAR MFG. CO.

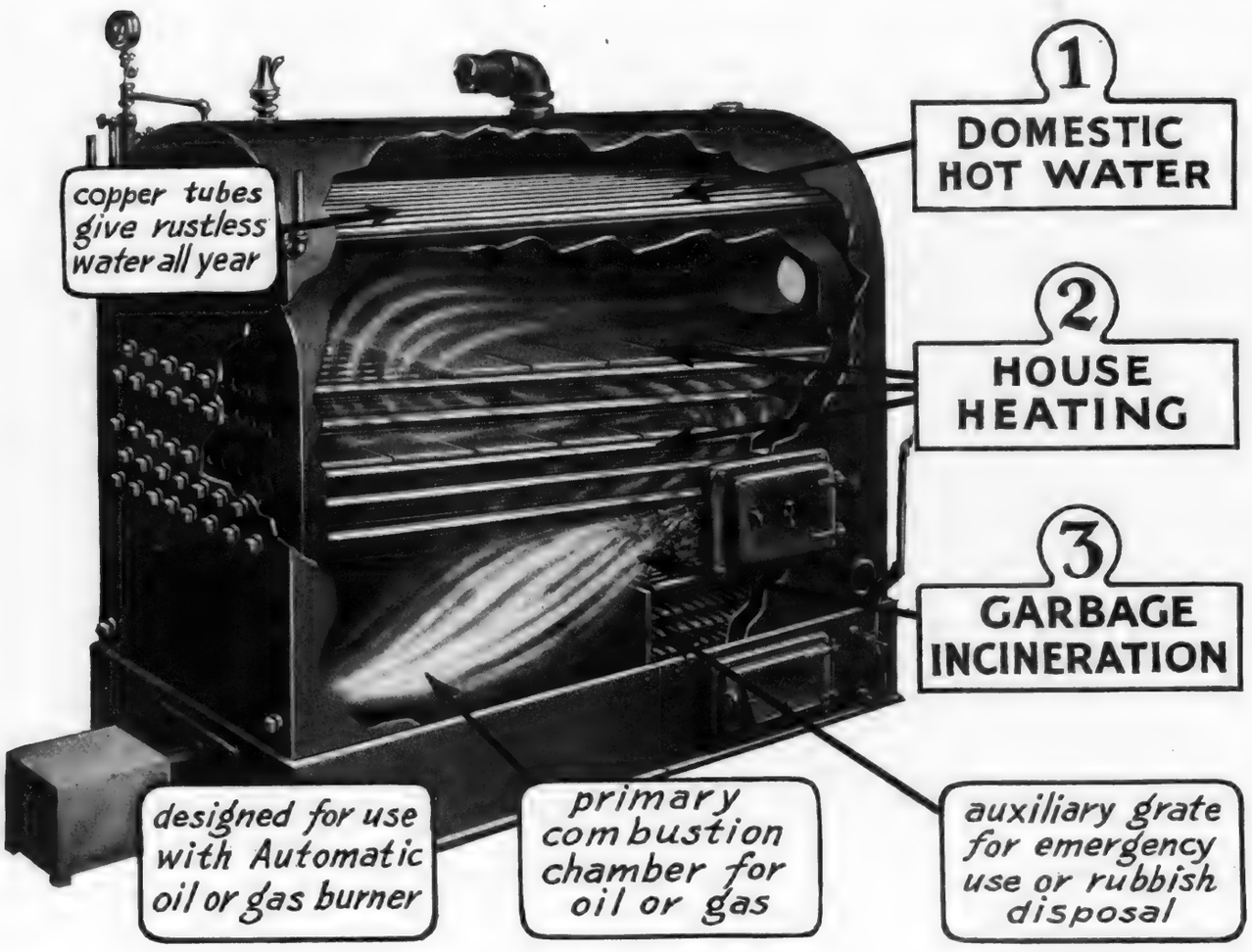
1905 S. Western Ave. CHICAGO, ILL.

Sales Engineers in all principal cities.

McALEAR

THIS BOILER

puts waste heat to work


1
DOMESTIC HOT WATER
2
HOUSE HEATING
3
GARBAGE INCINERATION
copper tubes give rustless water all year
designed for use with Automatic oil or gas burner
primary combustion chamber for oil or gas
auxiliary grate for emergency use or rubbish disposal

AMONG the many striking features of the International Triple Service Boiler is efficiency of an exceptionally high order. This is due to special inner design which creates an unusually long flue, so baffled that the burning gases are passed to and fro until the maximum absorption of heat has been achieved. In this manner a large amount of heat, that is wasted in an ordinary cast iron boiler, is put to work. For this reason the International Triple Service Boiler delivers more heat at no increase in fuel expense.

This feature, plus the many advantages inherent to the triple service type of boiler, strongly recommends the installation of the International Triple Service Boiler. Complete details, price and specifications on the International Triple Service Boiler will be gladly sent at your request.

The International Boiler Works Co.
East Stroudsburg, Penna.

DISTRIBUTORS

Thermo-Service, Inc.,
Room 1738, 101 Park Ave.,
New York City

Heating Equipment Corporation,
1194 Commonwealth Ave.,
Boston, Mass.

Univent *and* Glass *make the difference*

To the trained engineering mind

it is clear that Univent *results cannot be duplicated*

THANKS largely to the engineering profession, the Univent and its basic principle have gained nation-wide acceptance. With acceptance and success has come widespread imitation. There are, today, numerous machines which stimulate the Univent.

But one fact remains: where the layman might, for a time, be confused—the seasoned engineer, trained in investigation, sees clearly that Univent results are due to exclusive features of the Univent. They are results which cannot be duplicated.

The Univent is a complete individual ventilation machine built by an organization of specialists in heating and ventilating equipment. It draws air direct from out-of-doors, cleans it, warms it to a comfortable temperature, and silently delivers it throughout the room with agreeable air motion, but without drafts.

Let us tell you of results being accomplished through Univent Ventilation in schools, office buildings, banks, hospitals, and similar buildings. Write for engineer's edition of "Univent Ventilation." The Herman Nelson Corporation, Moline, Illinois.

No other ventilator gives

UNIVENT

(TRADE MARK)

VENTILATION

Our Contribution
to the art of Heating & Ventilation

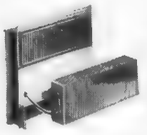
SIX YEARS AGO when the Herman Nelson light weight, compact, indestructible radiator was placed on the market, it was immediately accepted as the greatest advance in the art of Heating and Ventilation in a generation. It has made possible heating and ventilation dependability and performance hitherto unattainable. The Herman Nelson Wedge Core Radiator is an exclusive feature of all Herman Nelson Heating and Ventilating Products and accounts for their unequaled performance.

HEATING · VENTILATING · COOLING · DRYING · CONDENSING

UNIVENT

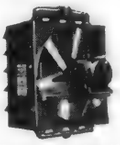
for the ventilation of schools, hospitals, offices and other buildings presenting an acute ventilating problem.

HERMAN NELSON *Invisible* RADIATOR



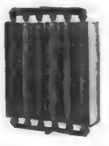
... supersedes all previous radiators, radiator cabinets or enclosures. Occupies no room space and makes possible any desired decorative scheme or furniture arrangement. Indestructible in service.

THE HERMAN NELSON hiJet HEATER



It operates at steam pressures from 1 to 150 lbs., and offers the better and more economical way of diffusing heat in Factories, Railroad Shops, Roundhouses, Mills, Warehouses, Garages, Gymnasiums and Industrial Buildings.

Herman Nelson Radiator Sections
for Blast Heating and Cooling



Indestructible, operating at any steam pressure from 1 to 150 lbs., non-corrosive and leak-proof.

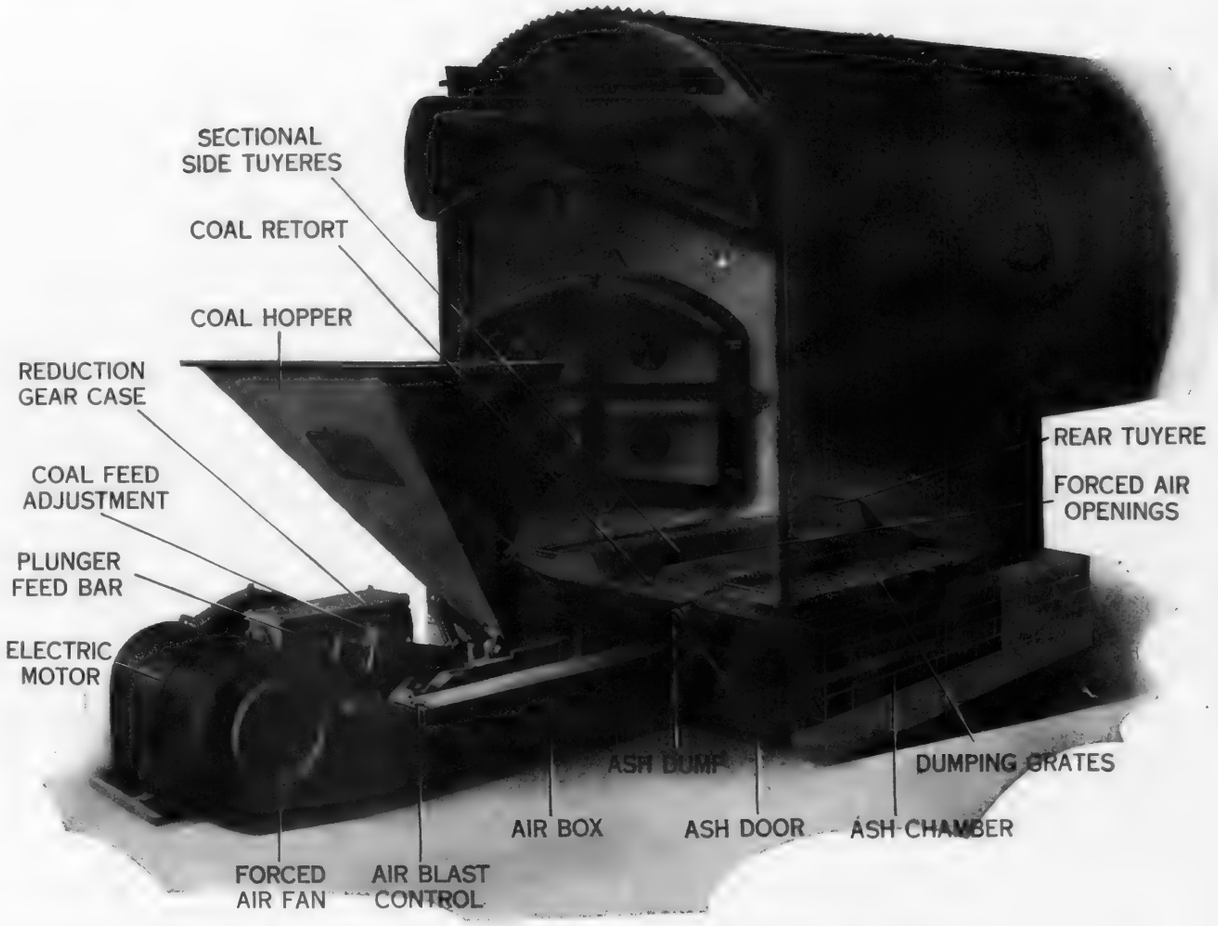
May be arranged in banks to solve any special problem of heating or cooling.

THE HERMAN NELSON CORPORATION · *Moline, Illinois*

Builders of Successful Heating and Ventilating Equipment for over 20 Years

Sales and Service

BELFAST, ME.	UTICA	SCRANTON	SAGINAW	CINCINNATI	DES MOINES	ST. LOUIS	DALLAS	DENVER	SEATTLE
BOSTON	BUFFALO	PITTSBURGH	DETROIT	TOLEDO	MILWAUKEE	BIRMINGHAM	OMAHA	SALT LAKE CITY	SAN FRANCISCO
PROVIDENCE	PHILADELPHIA	CHARLOTTE, N. C.	CLEVELAND	INDIANAPOLIS	GREEN BAY	ATLANTA	EMPORIA	SPOKANE	VANCOUVER
NEW YORK CITY	WASHINGTON, D. C.	GRAND RAPIDS	COLUMBUS	CHICAGO	MINNEAPOLIS	MEMPHIS	KANSAS CITY	PORTLAND	TORONTO
									WINNIPEG, MAN.



Outstanding Advantages of DETROIT JUNIOR STOKER

Plunger Feed Gives Control of Fuel Bed

Only with this system is combustion controlled and an even fire of proper depth maintained throughout the fuel bed. By simple adjustments of the stroke of the plunger the amount of coal fed and its distribution within the furnace are mechanically controlled. The depth of the fuel bed is uniform so that all of the coal is completely burned.

Mechanical Dump—Ashes Dumped Into a Pit

Designed on same principles as large side cleaning stokers. A mechanical dump is located within the furnace, so that without disturbing the fire, ash and refuse may be dropped to the ashpit and allowed to cool before removal. This keeps the boiler room clean and free from smoke, foul gases, dust and ashes. No disturbance of fire.

For Every Service—A Detroit Stoker

Descriptive matter on Detroit Stokers for boilers of every type and size from the smallest to the largest sent on request for general catalog. For Detroit JUNIOR Stokers ask for Bulletin 373.

DETROIT STOKER COMPANY
Third Floor General Motors Building **DETROIT, MICHIGAN**

DETROIT JUNIOR STOKER

A TRIUMPH IN COMBUSTION ENGINEERING

When you recognize the proof of 3 simple facts you will know

why you can't afford to plan heating without calling in a Skinner Man

The unit method is accepted as the best means of heating open-space buildings

Heating engineers and thousands of building owners know that the unit method does not merely bring heat into the room and then allow it to float up into the unused spaces overhead. Fans in the unit heaters direct the heated air where it is needed most, keep it down where your producers are working and, by recirculation, diffuse it equally over the entire room.

In applying the unit method, Skinner Brothers have had longer and more varied experience than anyone else

Skinner engineers *originated* the Unit Method of heating over 34 years ago. Since then they have adapted it to more than 8200 buildings of every structural type and presenting every imaginable heating problem. Such volume and variety of experiences have fitted Skinner engineers to plan effective heating for even the hardest-to-heat buildings.

Making all types of unit heaters, Skinner Bros. can recommend the one which best fits your building

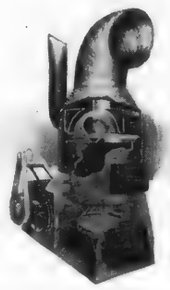
Skinner Brothers' selection of heaters for your building is *in no way restricted.* No matter what type will serve best—floor type or suspended, prime or extended-surface coils, steam or direct fired—it is found in the Skinner line. In adapting these different units, Skinner engineers have had notable success. Though always fully guaranteed, no Skinner heater has ever been returned.

Skinner Bros. Air Heaters

SKINNER BROTHERS MANUFACTURING COMPANY, INC.
1468 S. VANDEVENTER AVENUE, ST. LOUIS, MO.
BRANCHES IN ALL PRINCIPAL CITIES

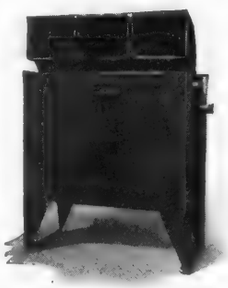
There is a Skinner Air Heater to fit the heating needs of every type of open-space building

Skinner Bros. "Baetz Patent" Air Heater



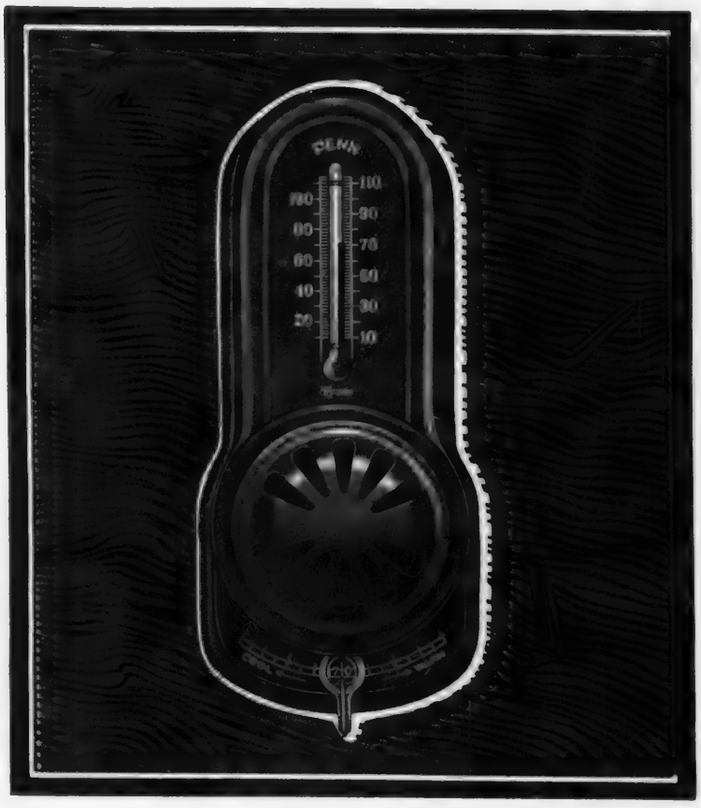
Skinner Bros. Direct-Fired Air Heater.

Skinner Bros. "Light-weight" Air Heater



Skinner Bros. Type "U" Air Heater

You'll MARVEL at the supreme sensitiveness of this NEW Thermostat for OIL BURNERS



THIS new and better controlling device for Oil Burners feels temperature changes with uncanny accuracy. Embodying the exclusive Penn Magnet Contacts, it operates on a 2-degree differential, and eliminates all fragile tubes and complicated hookups by carrying the load direct. Its astounding simplicity both in installation and operation will also appeal to you for the many time- and money-saving economies. Supplied complete, ready for installation. Harmonious appearance and an attractive price.

We invite you to test the new Penn Thermostat at our expense.

Manufactured by an organization of proven engineering ability that supplies the largest and best concerns of the country with automatic control switches.

PENN ELECTRIC SWITCH CO.

DES MOINES, IA.

A Complete Line of
Automatic Electric
Switches for
Oil Burners
Pumps
Refrigerators

Air Compressors
Thermostatic Switches
Float Switches
Unloader Pilots
Vacuum Switches
Pressure Switches

An Announcement

And the Electrol Creed

The men who are directing Electrol's progress have a deep-rooted faith in the future of the oil burner industry. They believe that the prosperity and growth of each manufacturer and its dealer organization are built on two foundation stones—man-power and management.

In building trained man-power for its dealers, Electrol has established the most complete sales and engineering training courses within the burner industry.

In building management, Electrol has pursued the policy of building up the strongest possible management. It has sought and secured outstanding men of proved capacity in oil-burner research, design, manufacturing and merchandising.

Through its latest step in carrying forward this policy Electrol announces that:

LEOD D. BECKER, having disposed of his interest in *Fuel Oil Journal,* becomes President of Electrol Incorporated.

M. E. SIMPSON becomes Vice-President in Charge of Sales, following the recent acquisition of the Electrol Distributing Corporation, of New York, by Electrol Incorporated.

HAN A. KUNITZ becomes Chief of Research Engineering.

* * *

W. T. KOKEN advances from President to Chairman of the Board.

LIONEL L. JACOBS continues as Vice-President and General Manager.

LEWIS L. SCOTT continues as Patent Attorney and Consulting Engineer.

J. P. FEELEY continues as Assistant to the General Manager.

Executive and Sales Offices of the company will be located in New York City. The factory remains at St. Louis.

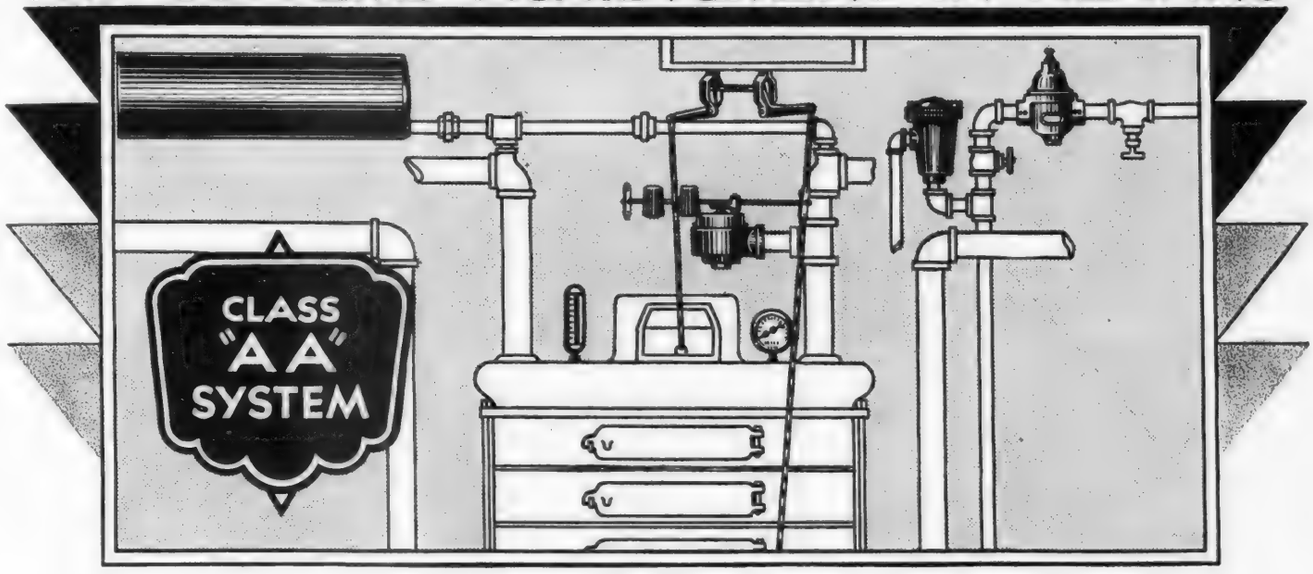
Under this leadership, Electrol's extensive program of sales expansion and engineering improvements, already under way, will be more intensively carried forward. This program, directed by this management, insures a wider lead for Electrol's position as the largest producer of quality burners. Actual shipments of Electrols this year already exceed last year by more than 60 per cent.

* * *

Electrol believes that discrimination between the sham and the solid, the superficial and the substantial, will be developed to a high degree in the burner industry during the year immediately ahead.

That which is unworthy carries its own punishment and its own penalty. Its true character is inevitably disclosed. When the "tumult and the shouting" die down, the strong man, the strong institution, the honest product, will be more solidly entrenched than ever.

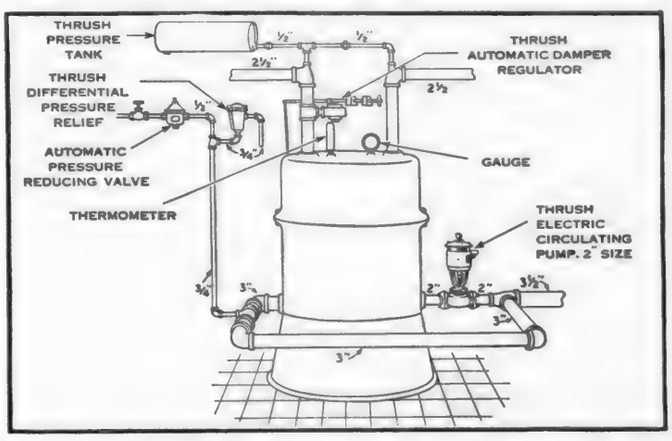
THE SUPREME ACHIEVEMENT IN HEATING

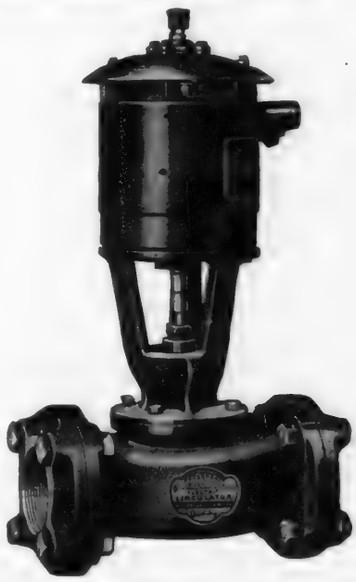


Greater Efficiency for Oil Burning

HOT WATER HEATING JOBS!

THRUSH System and the Thrush Electric Circulating Pump applied to oil burning Hot Water Heating Plants will greatly increase comfort and convenience and *save 20% to 30% of fuel consumed.* Get the facts now. Let Thrush Engineers help you design better installations or cure trouble jobs. *Tell us your problems.*





The Thrush Electric Water Circulating Pump

A Thrush forced circulating Hot Water Heating Plant costs less to install than vapor or two piped steam jobs. Has greater flexibility to meet changing weather conditions.

Maintenance cost lower than any method of heating known. No troublesome air valves or traps. Absolutely noiseless.

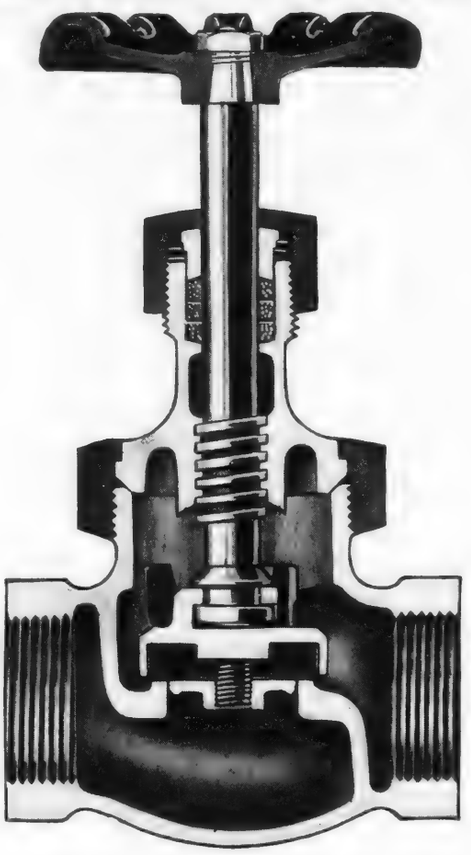
H. A. Thrush & Co.

Department A

Peru, Indiana

THRUSH ELECTRIC CIRCULATOR AND THRUSH SYSTEM OF HOT WATER HEATING

WALWORTH RE-NEW-DISC BRASS VALVE



For All-Around Service

150 LBS.

A Valve that Won't Wear Out

With the *Lock-On Slip-Off* Disc

As its name indicates, this is a valve with renewable disc, a feature making the Re-New-Disc virtually indestructible. The disc holder, which slips on the stem, is accurately guided and held in place by lugs which fit snugly against the inner walls of the bonnet chamber. The lock-on, slip-off disc, may be changed and renewed quickly and easily, and a "new" valve is ready for service.

The malleable iron stuffing box nut and bonnet ring lend durability to the valve—these parts may be unscrewed countless times without damage to the valve.

Walworth's Re-New-Disc is regularly furnished with hard composition discs for steam service; for cold water, gas or air, soft composition discs may be used. Discs of steam metals for special service are available.

All sizes have the lock-on disc except 1/4", 3/8" and 1/2".

WALWORTH

Walworth Company, General Sales Offices: 51 East 42nd St., New York
Plants at Boston, Mass.; Kewanee, Ill.; Greensburg, Pa., and Attalla, Ala.
Distributors in Principal Cities of the World
Walworth Company, Limited, 620 Cathcart St., Montreal, P. Q.
Walworth International Co., 11 Broadway, New York, Foreign Representative

Found only in the

ARCO PACKLESS

HOT WATER VALVE No. 901

PACKLESS Same packless features used on hundreds of thousands of Arco Packless steam valves without one failure.

EQUALIZING Gives every radiator proper circulation without breaking pipes or using lead gaskets—Assures perfectly balanced job —Saves fuel.

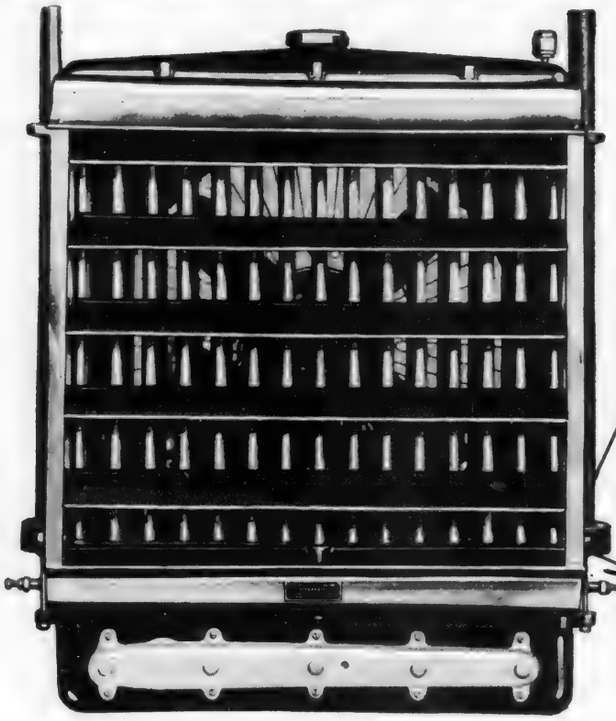
SWINGING PLATE Famous Arco Swinging Plate—Acts as tool to keep valve clean. Accumulation of sediment and sticking of valve is impossible. Concave plate reduces friction—insures full circulation.

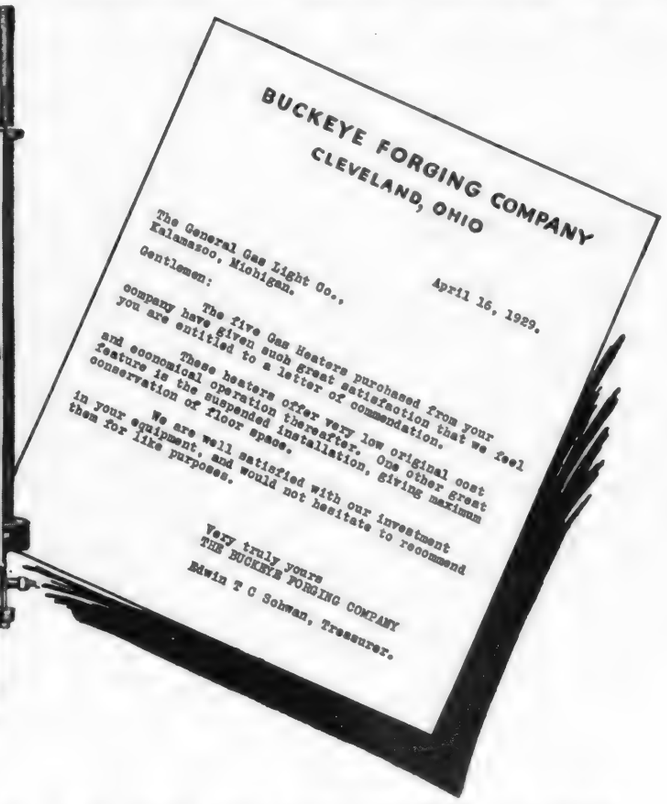
Greatest improvements ever introduced in hot water valve construction. All of these features in the 901 can be had for practically nothing—only a few cents more per valve. Compare with the cheapest valve you know about.

Your owners will appreciate these refinements and—for them—will gladly pay ten times the cost difference to you. It's worth it to owners. And it's your opportunity.

AMERICAN RADIATOR COMPANY

Heat entire factories with GAS UNIT HEATERS





BUCKEYE FORGING COMPANY
CLEVELAND, OHIO

The General Gas Light Co.,
Kalamazoo, Michigan.

April 16, 1929.

Gentlemen:

The five Gas Heaters purchased from your company have given such great satisfaction that we feel you are entitled to a letter of commendation.

These heaters offer very low original cost and economical operation thereafter. One other great feature is the suspended installation, giving maximum conservation of floor space.

We are well satisfied with our investment in your equipment, and would not hesitate to recommend them for like purposes.

Very truly yours
THE BUCKEYE FORGING COMPANY
Edwin T C Schwan, Treasurer.

INDUSTRIAL PLANTS, large and small, are profiting by the proven economies of the Humphrey Industrial Unit Heater.

They have found its cleanliness is in line with today's modern practices—no coal, no smoke, no dirt.

They have found that it permits a surprising saving in terms of lower overhead cost—no firemen, no boilers, no wasted fuel, no expensive floor space required.

They have found its convenience a great factor in successful plant management—the gas may be instantly turned on when heat is needed, and turned off when it is no longer required.

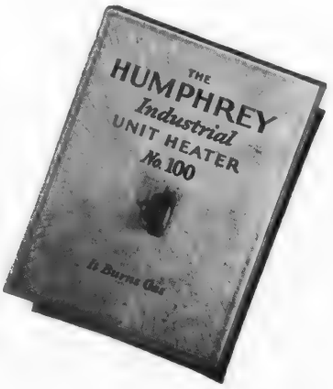
Greater production is secured on cold days because the constant, cheerful warmth of the Humphrey Industrial Unit Heater enables employees to do better work in real comfort in any part of the plant.

The letter above from the Buckeye Forging Company is only one instance of the efficiency of gas-heating with the Humphrey Industrial Unit Heater. Many others are experiencing the same results.

This complete heating system can be installed in any plant quickly and at little expense. Now is the time to prepare for cold days. Write for the Humphrey Industrial Unit Heater catalog illustrated below.

GENERAL GAS LIGHT COMPANY
KALAMAZOO, MICHIGAN
NEW YORK
44 WEST BROADWAY
SAN FRANCISCO
135 BLUXOME STREET

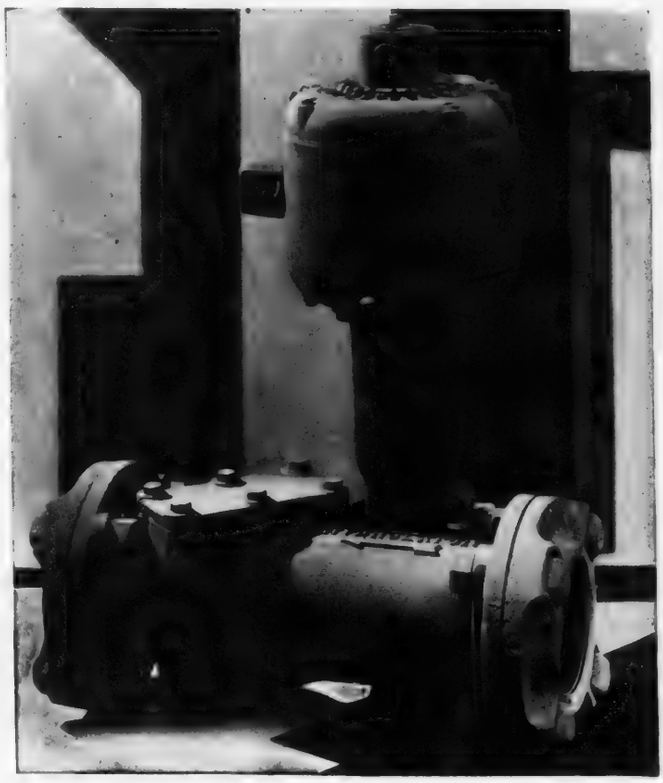
Send for this Catalog NOW!



The Humphrey
Industrial Unit Heater

There Is Only One HydrolatoR

HOT WATER SYSTEMS of the Future are being equipped with a HYDROLATOR TODAY!



PROGRESSIVE heating contractors everywhere have been quick to notice the decided trend toward HYDROLATOR-forced circulation in hot water heating—and they have been equally quick to take advantage of the new profit opportunities which the HYDROLATOR offers, not only on new hot water jobs but also on old "sick" jobs.

Old timers at the hot water heating game predict that the hot water system of the future is the HYDROLATOR-equipped job. That's probably why hundreds of heating contractors are starting to install the HYDROLATOR now—getting in on the ground floor.

Some Convincing Statements

"I certainly would not want to be without this HYDROLATOR because I feel that with its use it gives one a new conception of hot water heating!"

"We cannot praise it too highly and only hope that its merits can be made known to those who may be suffering as we were from a poorly installed system."

"The most efficient piece of mechanical equipment that can be installed in any system for the distribution of hot water."

Janette Manufacturing Co.

556-58 West Monroe Street
CHICAGO

Singer Bldg.
149 Broadway
New York

Real Estate
Trust Bldg.
Philadelphia

REPRESENTATIVES

Lydon, Cousart & Weeks
223 Latta Arcade
Charlotte, N. C.

E. W. Carr, Inc.
901 Carondelet St.
New Orleans, La.

G. E. Osgood
Florida Theatre Bldg.
Jacksonville, Fla.

T. A. S. Hall
318 So. 5 th St.
Louisville, Ky.

Harrison Sales Co.
53 Fourth St.
Portland, Ore.

H. Searth
4484 Cass Ave.
Detroit, Mich.

N. O. Nelson Mfg. Co.
10th and Chestnut
St. Louis, Mo.

P. R. Reese
501 Essex Bldg.
Minneapolis, Minn.

A. M. Weise
418 Fifth Ave.
Antigo, Wisc.

J. I. Krueger
357 Ninth St.
San Francisco

T. J. Graham Company
2507 Collingwood Ave.
Toledo, Ohio

Rex W. Williams
Scott Bldg.
Salt Lake City

Sullivan Valve & Mach'y Co.
Butte, Mont.

Harrison Sales Co.
314 Ninth Ave., N.
Seattle

PacificEngrg. Co.
734 E. 12th St.
Los Angeles

Mail Coupon for Complete Information

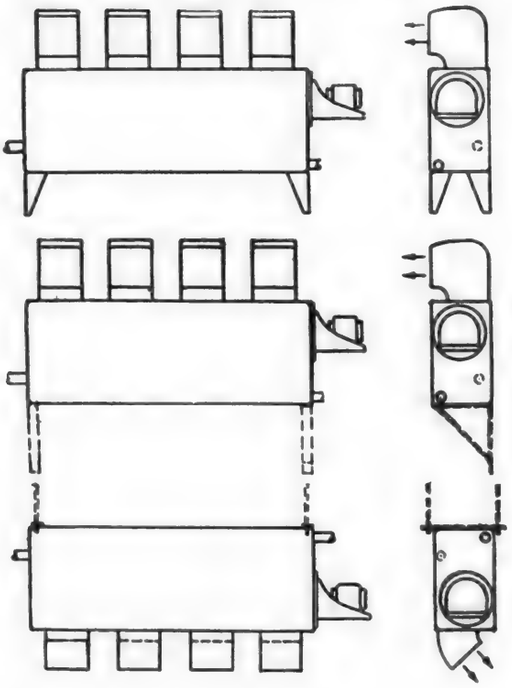
Janette Manufacturing Co., Dept. H 8
556-58 W. Monroe St.,
Chicago, Ill.
Gentlemen:
Please rush complete information, prices and discounts on your HYDROLATOR.

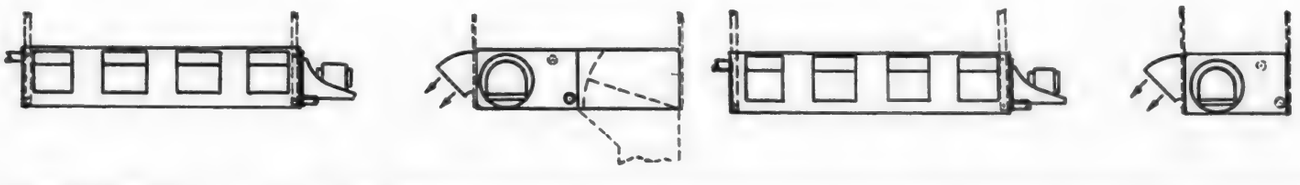
Name_____

Address_____

City_____ State_____

New Flexibility in Unit Heaters





THERE is a versatility about "Highboy" and "Lowboy" heaters which tempts the engineer to lay out an ideal system. It is easy to fit a Highboy or Lowboy to the space available, because these heaters are made in six lengths, two widths and seven arrangements, —all standard—all made with the same interchangeable die-stamped parts. Each heater has paneled sections—good looking—practical—strong.

Heating coil is self contained, easily removable, well known

UNIVERSAL AEROFIN —light in weight —non-corrosive

and highly efficient. If you haven't had your copy of our booklet No. 468 write for it today.

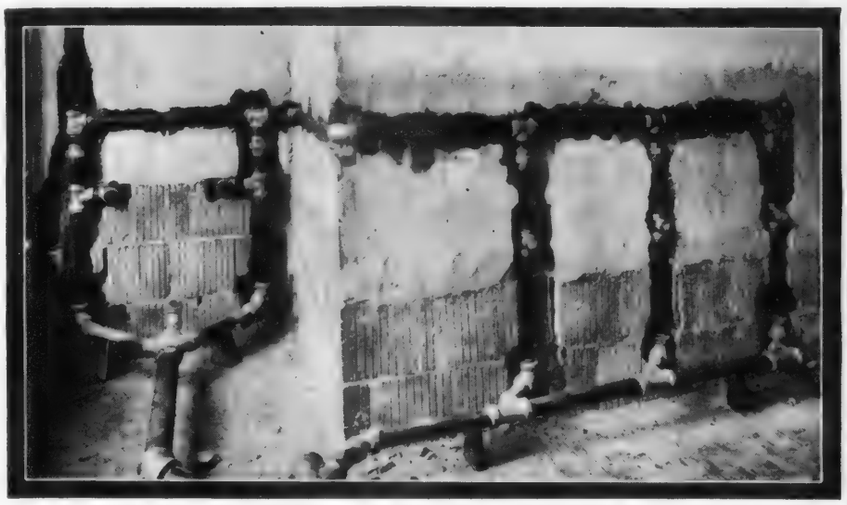
Buffalo Forge Company

480 Broadway Buffalo, N. Y.

In Canada: Canadian Blower & Forge Co. Ltd. Kitchener, Ontario.

"Buffalo" "Highboy" and "Lowboy" Unit Heaters

ARCO METAL PIPE



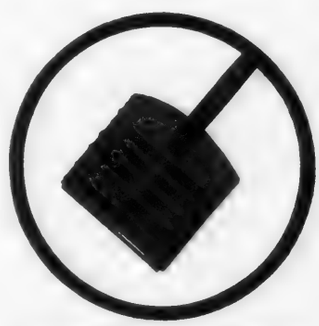
for MARSHALL FIELD & CO.'S GREAT CHICAGO STORE...

THE photograph above shows one of the many Arco Metal Pipe installations now being made in Marshall Field & Company's world-famous Chicago store. Throughout the building Arco Metal Pipe is being used exclusively to replace other piping which, after a few years of service, developed leaks. These leaks were so serious that the entire systems in many of the lavatories had to be completely torn out.

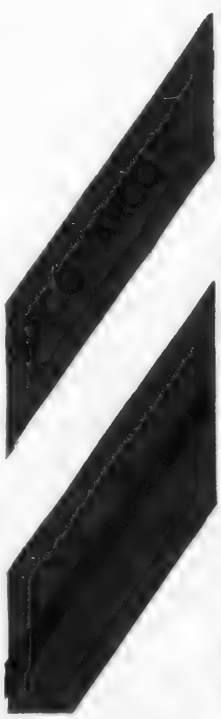
Arco Metal Pipe will prevent damage, trouble and expense of this kind—Arco Metal Pipe will mean permanence because it is a superior corrosion-resisting cast alloy pipe. It is made from a special nichrome alloy cast iron and cast by a process which gives it greater flexibility and tensile strength and far greater corrosion and erosion-resisting qualities than ordinary grey cast iron. And Arco Metal Pipe can be cut and threaded on the job with the same tools used on wrought steel and iron pipe.

Arco Metal Pipe is uniform in wall thickness—true to dimensions, smooth outside and inside. It is cast in vertical molds so there are no seams. Arco Metal Pipe is inexpensive and because of its long life, is actually an economy for any installation where corrosion and erosion are factors.

Arco Metal Pipe is sold by all leading wholesalers of plumbing and heating supplies. Accept no substitutes; it is readily distinguished with its coat of red paint, black stripe on one side and the name "ARCO" stenciled at intervals on the other. Ask our representative to show you a sample. Write today for information.

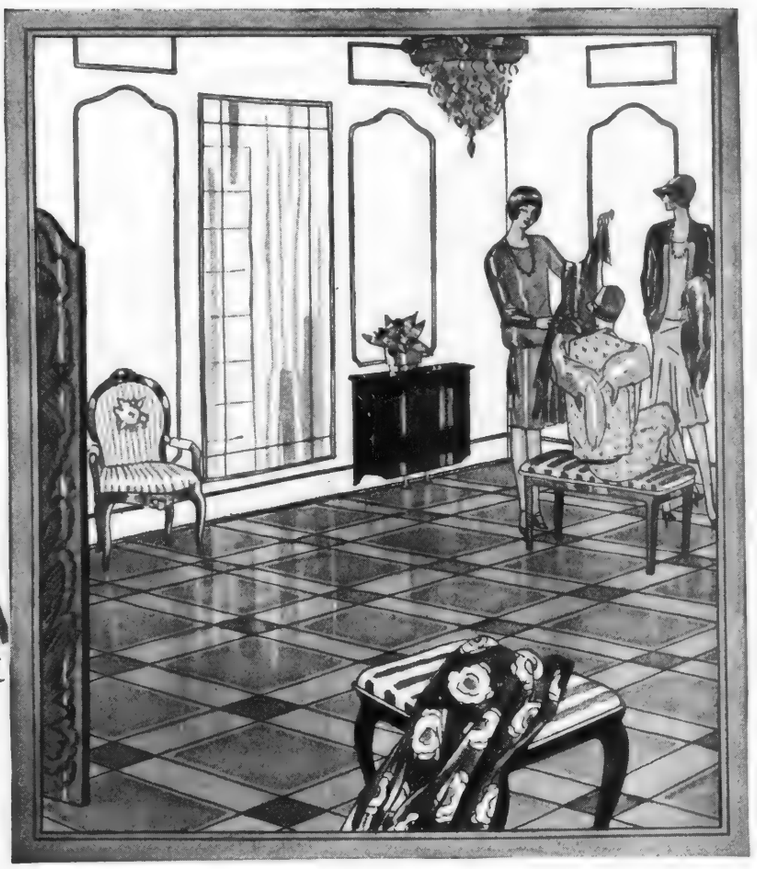


Arco Metal Pipe is the cast iron pipe that can be cut, threaded, and installed successfully with the same tools used on wrought steel and iron.



AMERICAN RADIATOR COMPANY

BRANCHES IN ALL PRINCIPAL CITIES



An Exclusive Modine PRODUCT

The Wall Cabinet Heater

THE Wall Cabinet Heater — built only by Modine—conforms to the most exacting demands of modern room decoration, but its cost makes it the most economical installation where utility is the prime consideration.

Because of the inclined position of its enclosed copper radiator, it extends only a few inches from the wall and is particularly desirable where space economy is necessary. It is the ideal radiation for smart shops, department stores, offices, hospitals, apartments and homes.

Complete information on Modine Cabinet Heaters and Modine Wall Type Cabinet Heaters will be sent on request.

Send for your copy of our new 4-color Booklet "Modine Cabinet Heaters". In addition to construction details and capacity details, it has numerous suggestions for Modine Cabinet Heaters in the decorative scheme.

MODINE MANUFACTURING COMPANY
1707 Racine Street RACINE, WISCONSIN

Originators of
COPPER RADIATION

USED IN PLACE OF CAST IRON RADIATION SINCE 1922

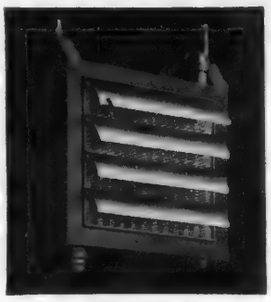
Manufacturers of
MODINE UNIT HEATERS

32/100 pounds per. sq. ft. E. D. R.

That's the average E. D. R. (equivalent direct radiation) of the 18 types and sizes of Trane Unit Heaters as installed — an outstanding achievement in heat transmission for equipment of this type.

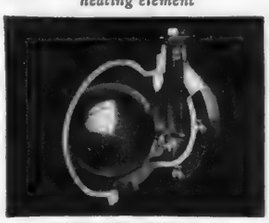
The patented Trane heating element is built of seamless copper tubing rolled into headers at each end stronger than boiler tubes. The tubes are given intimate contact with the extended metal fins by a patented Trane process. There are no soldered, brazed or welded joints to leak. Every Unit is tested for 350 lbs. pressure.

Trane Unit Heaters provide year-round ventilation facilities. Installations can be made to meet the strictest regulations. Low air resistance through the heating element and high efficiency fans, keep power cost at a minimum.

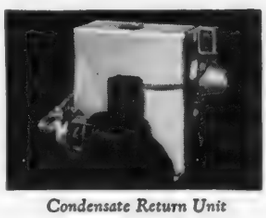


Standard Trane Unit Heater

Section through patented heating element



Float Drip Trap



Condensate Return Unit

Complete Heating Systems

Put Trane Float Drip Traps on all Unit Heaters and insure complete removal of condensate and entrained air. With Trane Condensate Return Units to handle the condensate you have a perfectly balanced heating system.

Trane makes everything for a complete heating system but the boiler and piping—the responsibility is undivided.

Send for the new booklet on Trane Unit Heating.

THE TRANE CO., (Dept. 8), 206 Cameron Ave., *La Crosse*, Wis.
In Canada: Trane Co. of Canada Ltd. Toronto, 2, Ontario

HEAT WITH UNIT HEATERS

HEAT CABINETS **TRANE** CONCEALED HEATERS
PUMPS, UNIT HEATERS, AND HEATING SPECIALTIES

The Dunham Differential Vacuum Heating System

provides completely satisfying heat for the beautiful new

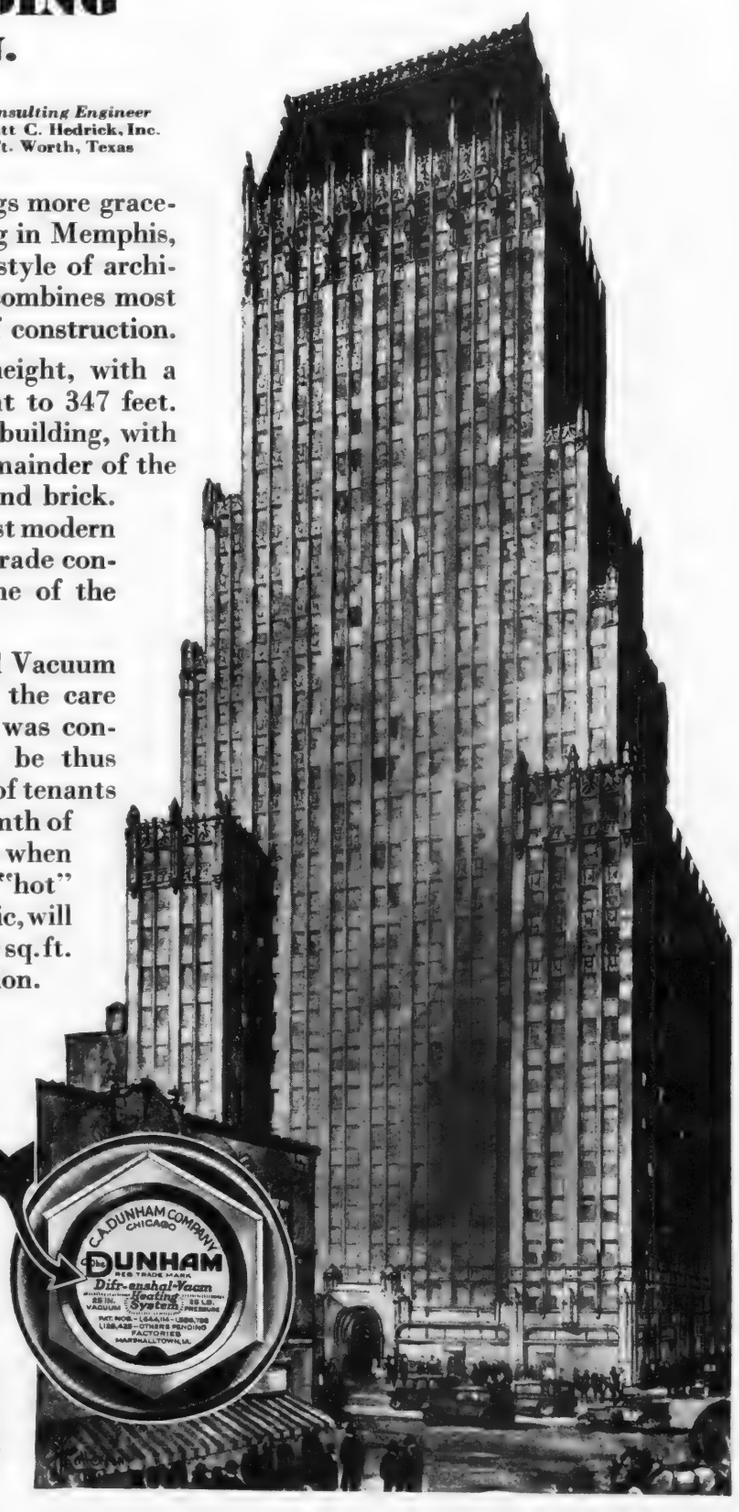
STERICK BUILDING
MEMPHIS, TENN.

Architect	*Heating Contractor*	*Consulting Engineer*
Wyatt C. Hedrick, Inc. Ft. Worth, Texas	J. W. Hull Plumbing & Heating Co., Memphis	Wyatt C. Hedrick, Inc. Ft. Worth, Texas

FEW American cities can boast of buildings more gracefully beautiful than the Sterick Building in Memphis, Tenn. The charm of the towering Gothic style of architecture in which this building is designed combines most fittingly with the modern set-back type of construction.

The Sterick Building is 29 stories in height, with a mansard roof which brings the total height to 347 feet. Polished granite is used in the base of the building, with three floors above in Bedford stone, the remainder of the building being faced with artificial stone and brick. High speed electric express elevators, the most modern of equipment and appointments and high grade construction throughout make the Sterick one of the South's most outstanding structures.

The selection of the Dunham Differential Vacuum Heating System for this building reveals the care with which every detail of its equipment was considered. For not only will fuel economy be thus assured the owners, but comfort and health of tenants will be cared for by the mild, beneficent warmth of Sub-Atmospheric Steam on the many days when but little heat is required; in colder weather "hot" steam, at pressures higher than atmospheric, will provide ample warmth. There is over 34,000 sq. ft. equivalent direct radiation in this installation.



C. A. DUNHAM CO.
DUNHAM BUILDING
450 E. Ohio St., CHICAGO

Over eighty sales offices in the United States, Canada and the United Kingdom bring Dunham Heating Service as close to you as your telephone. Consult your telephone directory for the address of our office in your city. An engineer will counsel with you on any project.

Look for the name DUNHAM

This nameplate identifies a genuine Dunham Thermostatic Radiator Trap.

The Dunham Differential Vacuum Heating System and individual parts of the apparatus used in that system are fully protected by United States Patents Nos. 1,644,114 and 1,706,401, and Canadian Patents Nos. 282,193, 282,194 and 282,195. Additional patents in the United States, Canada and foreign countries are now pending.

There is no substitute for experience

Set down all of the claims made for all contemporary Vacuum Heating Systems. Check up, point by point, and you will find that Webster Vacuum Systems of Steam Heating, standard since 1888, meet more of the requirements more fully than any other. Why? There is no substitute for experience.

Set down all the advantages claimed for all radiator return traps for all time. Consider materials, sensitiveness of operation, scientific compensation for pressure, long life. Check the Webster Sylphon trap, point by point, against the requirements. Again, you will find each requirement met more fully for a longer time than by any other. Why? *There is no substitute for experience.*

The Webster Type "R" System, too, embodies the proven features of Webster Vacuum Systems, and offers heating [illegible] opportunity to develop "preferred" business in smaller buildings.

Perhaps you have not thought of heating [illegible] terms. Ask us to work with you on your next heating problem and we will make a sincere endeavor to prove our statement that *there is no substitute for experience.*

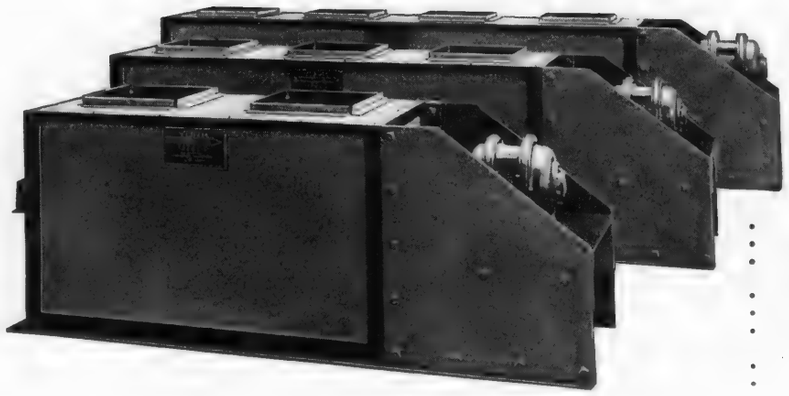
-since 1888 Webster Systems of Steam Heating

The Webster Steam Heating Specialist in your vicinity can probably help you in developing *preferred* business with Webster Type "R" Systems. Get in touch with him.

a 1 46 H.C.

WARREN WEBSTER & COMPANY, Camden, New Jersey
Pioneers of the Vacuum System of Steam Heating...Founded 1888
52 U. S. Branch Offices...*In Canada, Darling Bros., Ltd., Montreal*

These YORK Unit Fans assure Important Economies both of installation and operation



The same engineering skill that brought York Heat-Diffusing and Air-Conditioning Units to outstanding leadership is shown in every feature of York Unit Fans.

Modern factory methods and huge output make possible prices and deliveries extremely advantageous to the buyer.

A large field organization with extensive engineering background keeps you in touch with headquarters and a friendly service is always available. *York Heating & Ventilating Corporation, 1539 Sansom St., Philadelphia.*

No. 1 disc type Exhaust Fan, 16″ diameter—capacity 2100 C. F. M.

1. Easier to install—fans and motor are a Unit needing no separate support.
2. No platform required.
3. May be suspended from rods.
4. Both fan and motor equipped with ball bearings.
5. *Take rectangular ducts.*
6. *Can be installed in straight run of duct work without an offset.*
7. *Due to Multiple Fan Assembly, width and depth of unit are less than for any other fan of the same capacity.*
8. One type of units for vertical installation, one type for horizontal.
9. Motor outside of air stream.
10. Capacities from 1000 C. F. M. to 15000 C. F. M.
11. For supply or exhaust ventilation.

YORK ENGINEERED PRODUCTS

YORK HEATING & VENTILATING CORPORATION

Makers of the famous York Heat-Diffusing Unit

PHILADELPHIA

BROWNELL

Stands Alone

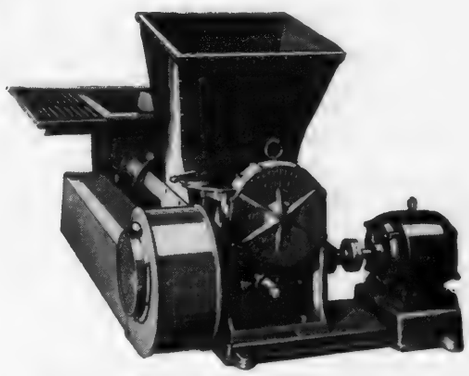
The Brownell Company has been designing and building boiler room equipment for 74 years. They are the only company in the entire country building both boilers and stokers. Neither is an assembled product — both being designed and built in their entirety at the Brownell Shops.

The Brownell Welded Steel Boiler line is complete and embodies features exclusively "Brownell"—features that combine in one unit effective heating, year round domestic hot water service without resorting to an auxiliary heater, and without heating the building in warm weather; also when oil fired, an odorless inbuilt incinerator.

Send for Boiler Bulletins M-65 and S-65 — also Stoker Bulletin S-50.

THE BROWNELL COMPANY, Dayton, Ohio

Representatives in principal cities



Brownell Automatic Underfeed Stokers are far heavier built than any other make—also built to closer tolerances—obviously reducing maintenance expense and prolonging their period of dependable service.

Brownell

Electric Welded Steel

Boilers

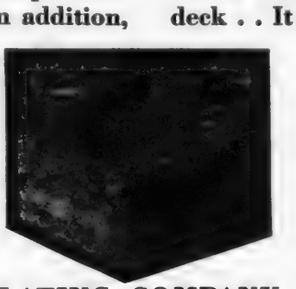
PROTECTED

from . . .
heat loss . . .
heat penetration
. . condensation
by 50,000 sq. ft. of

FLAX-LI-NUM

ARCHITECTS and heating experts have by actual practice proven that FLAX-LI-NUM is an ideal material for roof insulation. Not only has it high intrinsic insulating value . . Not only does it prevent heat loss . . heat penetration . . and condensation . . but in addition, its semi-rigid form assures a permanent bond between the material and the roof deck.

50,000 sq. ft. of full one inch FLAX-LI-NUM protect the roof of the Cream of Wheat Building at Minneapolis . . 50,000 sq. ft. of a material equal in insulating value to 27 inches of solid concrete . . FLAX-LI-NUM is made in full one inch thickness . . for roof insulation . . It is flexible in form to conform with the deck . . It will not break, crack or tear . . Where sheets butt together the flax fibres interlock forming a continuous sheet of insulation over the entire roof. Let us send you a copy of the FLAX-LI-NUM Manual containing valuable reference information.



FLAX-LI-NUM INSULATING COMPANY, *St. Paul, Minnesota*

Flax-li-num

A CORRECT BUILDING INSULATION AND SOUND CONTROL MATERIAL

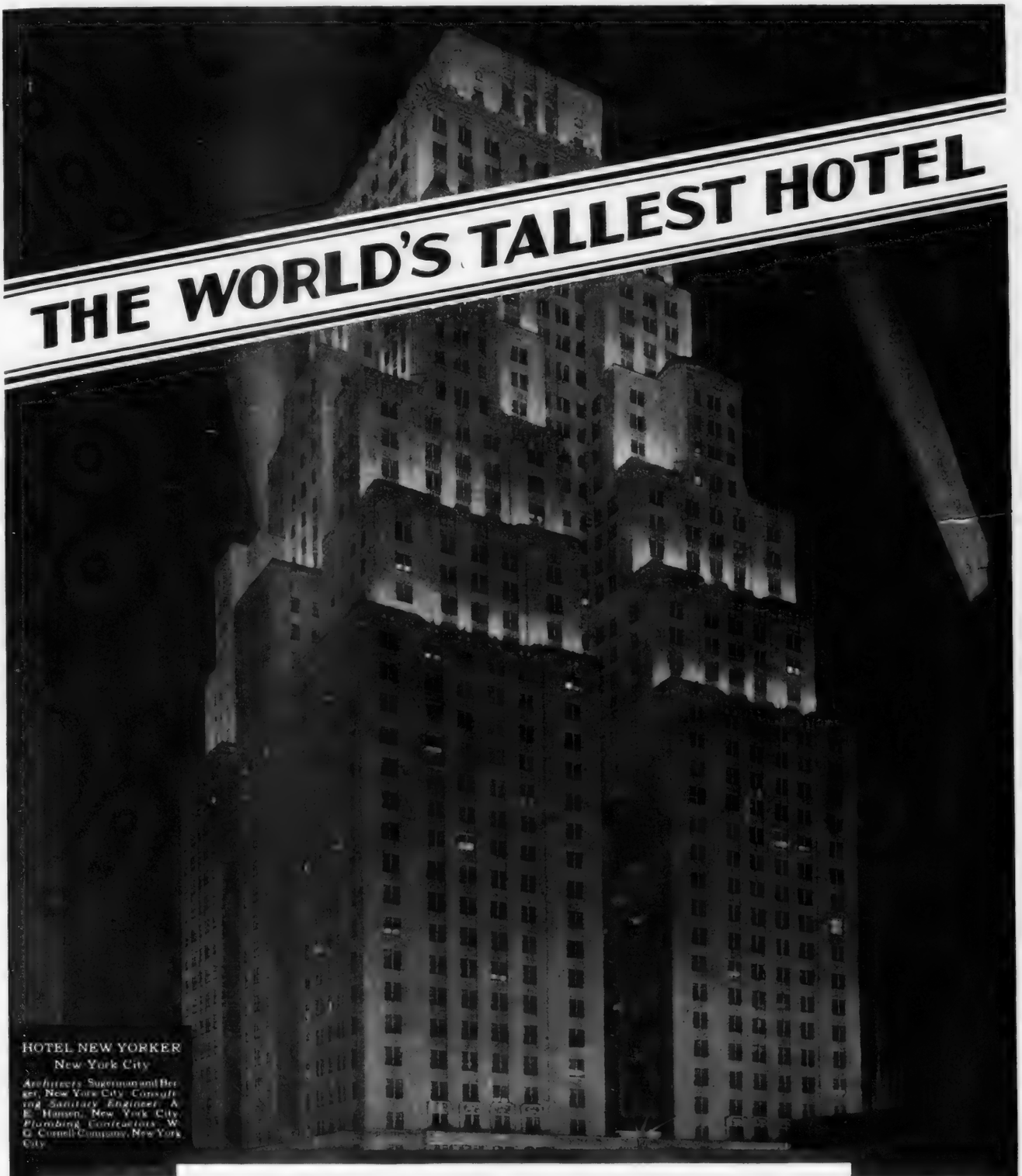
FLAX-LI-NUM INSULATING COMPANY
St. Paul, Minnesota

HV-8

Send me complete information about Flax-li-num. Also facts about the 2-air-space method.

Name..... City.....

Address..... State.....



HOTEL NEW YORKER
New York City

Architects: Sugerman and Berger, New York City. *Consulting Sanitary Engineer*: A. E. Hansen, New York City. *Plumbing Contractors*: W. G. Connell Company, New York City.

THE NEW YORKER—NEW YORK CITY

Another triumph in building wonders . . . New York's tallest and largest hotel . . . joins America's long list of imposing hostelries. The New Yorker's towering lines of beauty, its luxury and comforts are backed by quality material, particularly in the mechanical part of the structure . . . its major pipe tonnage bears the name NATIONAL Copper-Steel Pipe . . . especially resistant to atmospheric corrosion in soil, waste, vent lines and rain leaders.

Ask for *Bulletin No. 11*—Copper-Bearing Steel Pipe.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.

***Subsidiary of* United States Steel Corporation**

NATIONAL COPPER-STEEL PIPE

MARSH RE-ENFORCED PACKLESS, CONE DISC LINE, complete in ALL PATTERNS and SIZES; *Angles, Globes, Corner* and *Back Offsets,* both PACKLESS and MODULATED types.

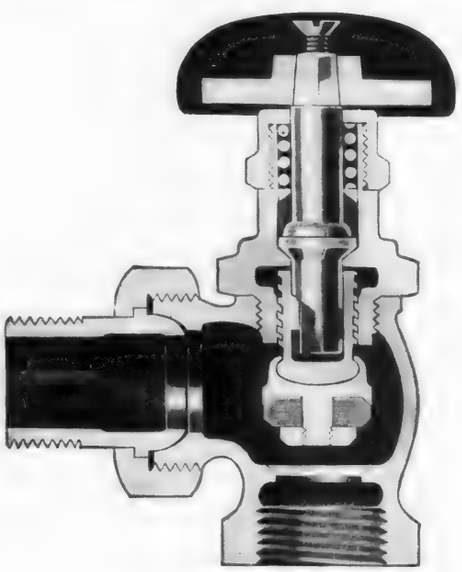


Fig. 141—Sectional View

Fig. 141

In addition to the above CONE DISC LINE, our FLAT DISC LINE is ALSO COMPLETE IN ALL PATTERNS and SIZES, BOTH PACKLESS and MODULATED.

FURTHER: We furnish complete line of GLAND PACKED, rising stem valves, *Angles, Globes, Corner* and *Back Offsets,* all Sizes, BOTH in CONE and FLAT DISC Patterns. Also, ***quick opening*** and ***upper seat*** GATE Valves, ***both with screwed ends*** and ***with unions, all sizes.*** Line complete. Get our Catalog and Discount Sheet.

WE SPECIALIZE on HIGH GRADE radiator valves, THEREFORE QUALITY; and manufacture and furnish the largest and most complete line of any company in the world, THEREFORE QUANTITY at minimum cost; and—QUALITY and COST—are two important factors to consider in placing orders.

EVERY VALVE IS FULLY GUARANTEED

MARSH VALVE COMPANY

DUNKIRK **NEW YORK**

General Sale Distributors

Edward T. Hetherington
1709 Sansom St., Philadelphia

Appleton & Liptrott, Inc.
1480 Broadway, New York

John W. Mabbs
431 So. Dearborn St., Chicago, Ill.

UNITED STATES RADIATOR CORP'N
General Offices: Detroit, Mich.

SARCO COMPANY, Inc.
183 Madison Ave., New York

Taylor-Forbes Company
Canadian Agents Guelph, Ont.

. . dependability

WHEN you install a heating system, your own interest demands that the installation be mechanically perfect and give lasting satisfaction. Massachusetts Unit Heaters, a reliable product built by heating specialists of many years standing, will accomplish this result.

Built in several sizes of both floor mounted and ceiling suspended types, these unit heaters embody numerous outstanding features.

1—Extremely high heating capacities per unit of space occupied.

2—The use of High Pressure Arcoblast—designed for 200 pounds per square inch working pressure.

3—Universal discharge cowls which may be turned in any direction on square outlets.

4—A three bearing shaft which lends greater stability and eliminates whipping of the shaft.

5—Fafnir self-aligning pillow block bearings, fitted for alemite lubrication.

The installation of Massachusetts floor mounted and ceiling suspended Unit Heaters is greatly simplified by the arrangement of the heater section, which is readily removable from the casing, into which it slides like a drawer.

Write for further information or, upon your request, we will have our nearest representative call to explain the Massachusetts line of Unit Heaters in detail.

The BISHOP & BABCOCK SALES COMPANY, Cleveland, O.

General Offices—4901-4915 Hamilton Avenue, N. E.

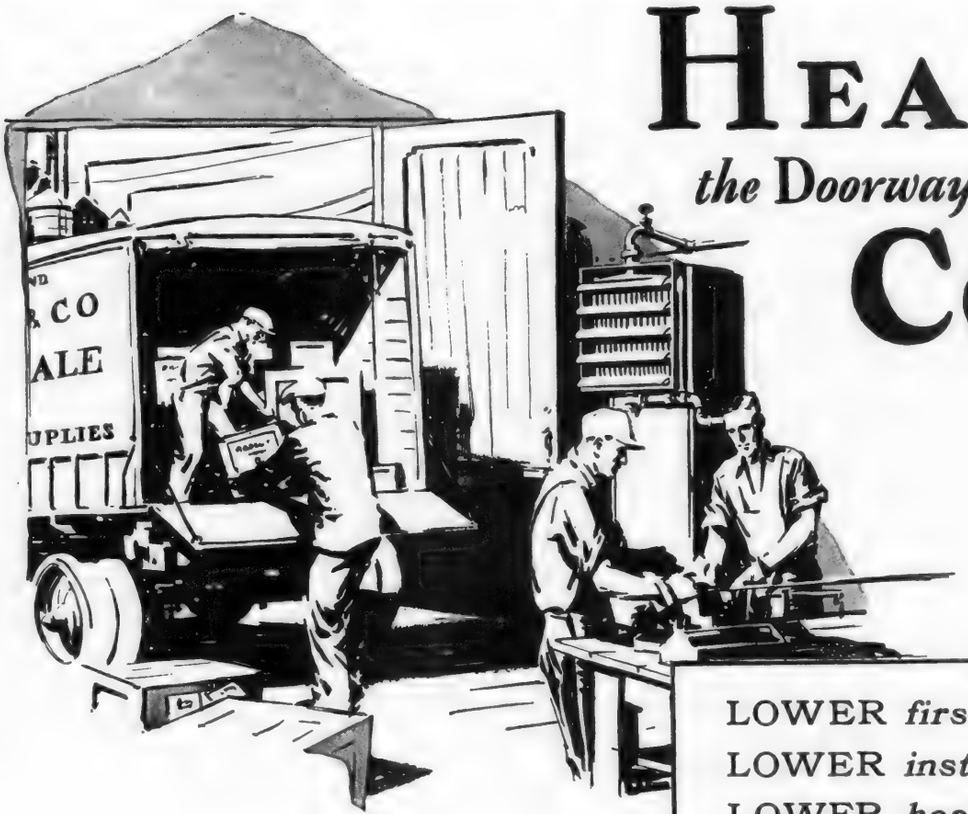
SALES AND SERVICE OFFICES

Baltimore Boston Bridgeport Buffalo Chattanooga Chicago Cleveland Dallas Denver Detroit Little Rock Los Angeles
Minneapolis Montreal, Can. Nashville New York Oklahoma City Philadelphia Richmond Scotia, N. Y. Spokane St. Paul Tulsa

BISHOP & BABCOCK

TEMPERATURE REGULATION
HEATING SPECIALTIES VENTILATING EQUIPMENT

HEAT
the Doorway that's always
COLD!



LOWER *first costs*
LOWER *installation costs*
LOWER *heating costs*

VENTURAFIN
TRADE MARK REG.
METHOD OF HEATING

Heat with Unit Heaters

ICY DRAFTS no longer chill the whole building whenever doors swing open, once Venturafins stand guard at your doorway. Venturafin Unit Heaters easily conquer any cold that comes their way. They are always effective and efficient.

With the Venturafin Method of Heating, you can actually *control* heat in every part of the building. You can *force* healthful, heated air—accurately and directly—where it is needed most. You can wipe out cold corners and heat pockets. You can avoid freezing one worker and roasting the next.

Venturafin forces heated air directly into working areas—*where* you want it, *when* you want it, and as *much* as you want. It saves you the needless expense of heating ceiling areas first.

You'll be surprised, too, at the moderate cost of Venturafin Units . . . their adaptability to practically any position in your plant . . . their economy of space . . . their low maintenance costs and the actual saving in fuel that results year after year. You'll note, also, the increased productiveness of your men when they work under heating conditions that are exactly right.

Call in any of the reliable heating contractors in your city. Ask them for all the facts about Venturafin, or mail the coupon.

AMERICAN BLOWER CORPORATION, DETROIT, MICH.
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONT.
BRANCH OFFICES IN ALL PRINCIPAL CITIES

American Blower
"Sirocco"
VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT
MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1906

For stores, showrooms, factories, shops, garages and many other types of buildings.

(886)

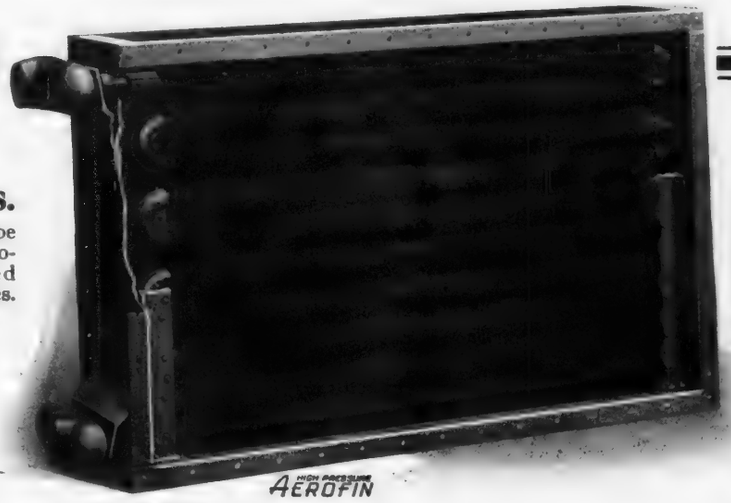
COUPON

American Blower Corp.
6000 Russell St., Detroit

Please send me your 24-page Venturafin Book

*Name*_____

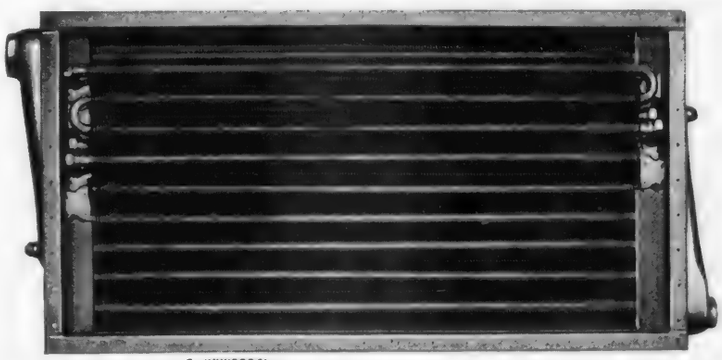
*Address*_____ *City*_____



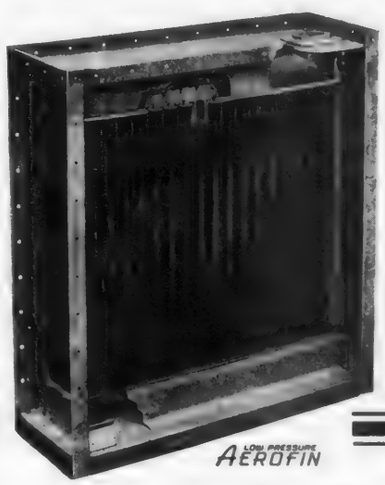
25 to 350 lbs.
Continuous seamless tube construction. One-, Two- or Three-Row Encased Units. 15 Standard Sizes.

Do You Know your AEROFIN?

(The Standardized Light-Weight Fan System Heat-Surface)



2½ to 150 lbs.
Continuous seamless tube, multi-coil construction. One-or Two-Row Encased Units. Six or Nine Tubes across face. Type R for Re-heaters. Type T for Tempering Units. 136 Standard Sizes.



Up to 50 lbs.
Proved flexible tube-plate construction, solderless steam joints. One-, Two- or Three-Row Encased Units. 45 Standard Sizes.

A SINGLE comprehensive Bulletin containing complete Engineering Data on all types of AEROFIN is now available gratis upon request. In addition to Final Temperatures and Condensations at various Pressures and Physical Data, there are large, readable Temperature Effect Charts on linen and many Piping Diagrams in four colors, an invaluable compilation from the knowledge and experience of some of America's most brilliant Engineers. Ask Newark for Bulletin V-89.

AEROFIN
is sold only by Manufacturers of nationally advertised Fan Heating Apparatus

AEROFIN CORPORATION

Burnham Building
CHICAGO

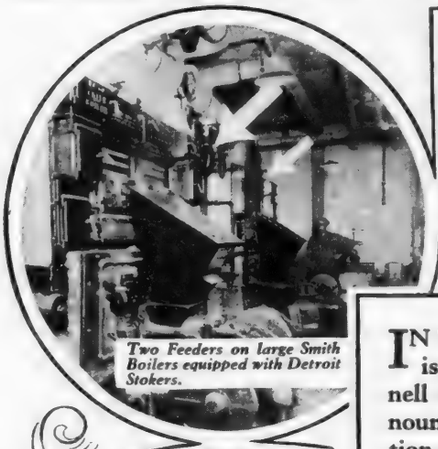
Land Title Building
PHILADELPHIA

850 Frelinghuysen Avenue, NEWARK, N. J.
11 West 42nd Street, NEW YORK
United Artists Building
DETROIT

Oliver Building
PITTSBURGH

Paul Brown Building
ST. LOUIS

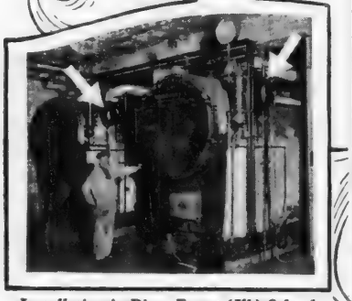
It stands on its record



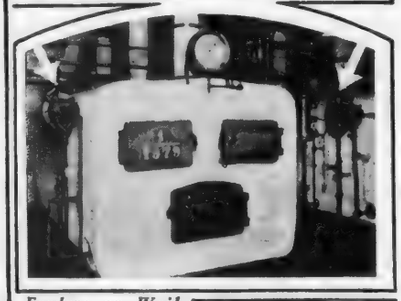
Two Feeders on large Smith Boilers equipped with Detroit Stokers.

Feeders in Brookline, Mass. Apartment Bldg.

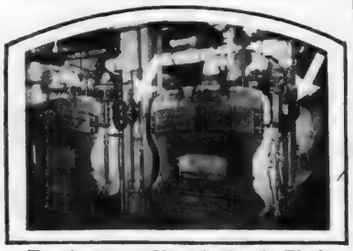
Feeders on Heggie-Simplex Oil-Fired Boilers.



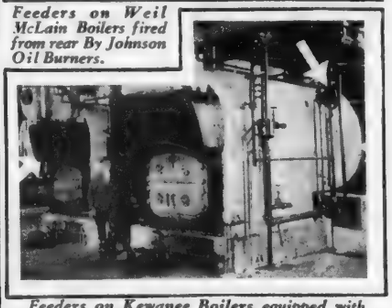
Installation in River Forest (Ill.) School.



Feeders on Weil McLain Boilers fired from rear By Johnson Oil Burners.



Two feeders on Utica Boilers in Washington, D. C. Apartment Bldg.



Feeders on Kewanee Boilers equipped with Hardinge Oil Burners.

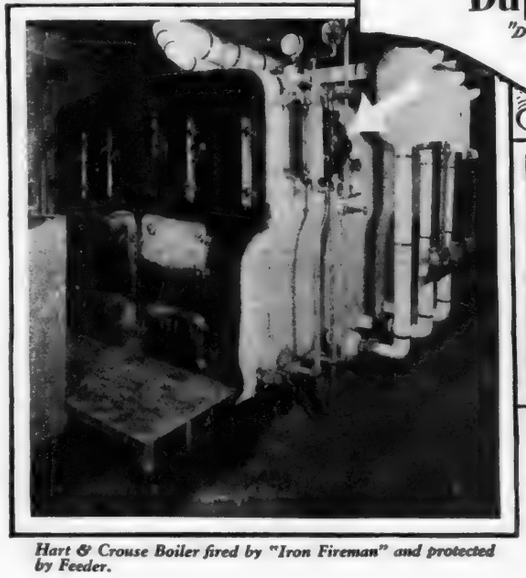
IN THE absence of facts one man's theory is as good as another's. When the McDonnell & Miller *Self-Cleaning* Feeder was announced, there was a great deal of speculation as to whether rotary valves were *right*—as to whether this feature or that feature was right.

But today hundreds of feeders on boilers of every type operating under every conceivable condition of service have supplied the answer. The McDonnell & Miller *Self-Cleaning* Feeder now stands squarely on its record. It is a monument to "doing one thing well"—and sticking everlastingly to it. This is brought out, within the limitations of space, by the installations illustrated here.

The big season is just around the corner. If you haven't the facts, write for booklet at once.

McDONNELL & MILLER
710 Wrigley Bldg., Chicago

McDONNELL & MILLER
SELF-CLEANING
Duplex Feeder
"Doing one thing well"



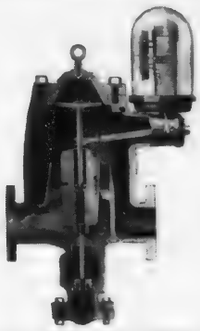
Hart & Crouse Boiler fired by "Iron Fireman" and protected by Feeder.

Feeder in Beier Bakery, Dixon, Ill.—an excellent application.

Two Feeders in National Education Assn. Bldg., Washington, D. C. on Johnston oil-fired Boilers.

Specialists in District Heating

Equipment for Underground Steam Lines



ST. JOHN STEAM FLOW METER
Measures consumption by flow of live steam.

The A. J. Reynolds Tobacco Company Takes the Guesswork Out of Steam Consumption

When the A. J. Reynolds Tobacco Company set out to find a meter, they looked for one that would be accurate and unfailing — that would require the least possible maintenance — and they finally selected the St. John Flow Meter.

St. John Steam Flow Meters indicate and record the flow of steam from 10 to 250 pounds gauge pressure with a mechanism so sensitive that an accuracy within 2% is assured.

The performance of these meters may be measured by the fact that the Bush Terminal and New York Steam Corporation alone have over fifteen hundred of them in service.

If you use steam, mail the coupon below.

ADSCO Engineering Department Is At Your Service

As pioneer in the distribution of steam from a central source ADSCO is widely regarded as the authority on all subjects pertaining to distribution of liquids and gases through pipe lines. The knowledge and experience acquired over a period of fifty years is available to you through our Engineering Department — which will be glad to cooperate with you in the designing of pipe lines for any purpose.

AMERICAN DISTRICT STEAM COMPANY

NORTH TONAWANDA, N.Y.

to be sure of getting

ADSCO

EQUIPMENT

Order Direct

The First Step is to get this literature

AMERICAN DISTRICT STEAM COMPANY
NORTH TONAWANDA, N. Y.

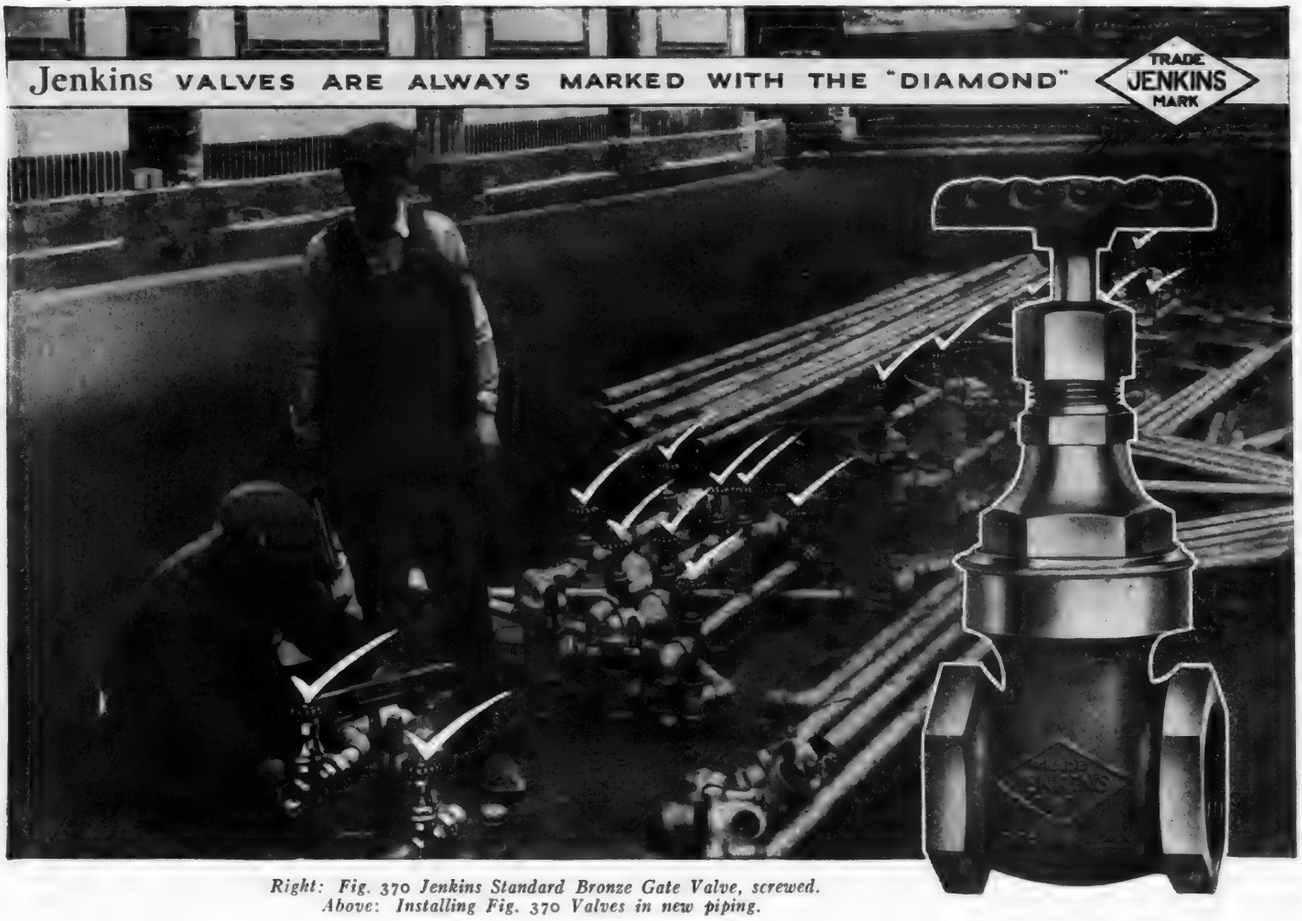
Please send me free Literature on "ADSCO" Meters and other products.

Name.....

Position.....

Company.....

Address.....H&V 8



Right: Fig. 370 Jenkins Standard Bronze Gate Valve, screwed.
Above: Installing Fig. 370 Valves in new piping.

Easily installed.... save time

Contractor's men like to handle Jenkins. They like the "heft" of these sturdy valves with bodies that aren't sprung under rough treatment. They like the heavy clean cut threads that reduce the possibilities of stripping, and which simplify the work of installation. And they know that when Jenkins go in, they go to stay.

Your supply man can furnish Jenkins Valves of bronze and iron, in standard, medium and extra heavy patterns.

JENKINS BROS.

80 White Street, New York, N.Y. — 133 No. Seventh Street, Philadelphia, Pa.
524 Atlantic Avenue, Boston, Mass. — 646 Washington Boulevard, Chicago, Ill.
JENKINS BROS., Limited, Montreal, Canada; London, England
Factories. Bridgeport, Conn., Elizabeth, N. J.; Montreal, Canada

Jenkins
VALVES
Since 1864

These three folders contain technical data often invaluable to the heating engineer. Keep them always available.

Keep these insulation data folders ready in your files

HERE are the coefficients of heat transmission for the most common types of walls, roofs, floors and ceilings . . . calculated both without insulation and with Celotex insulation . . . presented in compact, usable form for quick reference.

The actual savings in fuel and radiation obtained with various thicknesses of Celotex Roof Insulation Board have been carefully tabulated . . . offering an extremely complete presentation of this important subject.

The figures are based upon the most reliable and authentic test data available . . . and have been widely accepted by heating engineers everywhere.

Many engineers have had no idea that such comprehensive and exact figures were available . . . have been amazed at the practical value of this wealth of technical data.

Write for these three folders: *Heat Insulation Data*, the *new Supplement* to this data, containing comparative figures on "double-thick" Celotex, and *Dividends from Proper Roof Protection*. Keep them in your own files where they will always be available on a minute's notice. We will gladly forward your copies without charge or obligation.

The auxiliary folders: *FACTS about the economy of house insulation*, and *Celotex Industrial Insulation Board, its various money saving uses*, are also filled with interesting information . . . and will be sent you on request.

Here are two auxiliary folders filled with interest for men whose work is the solution of heating and insulating problems.

THE CELOTEX COMPANY
919 North Michigan Avenue,
Chicago, Illinois
Mills: New Orleans, Louisiana
Branch Sales Offices in many principal cities
(See telephone books for addresses)
Sales Distributors throughout the World
In Canada:
Alexander Murray & Co., Ltd., Montreal

The word
CELOTEX
(Reg. U. S. Pat. Off.)
is the trademark of and indicates manufacture by
The Celotex Company, Chicago, Ill.

CELOTEX
BRAND
INSULATING CANE BOARD

Our own engineers will gladly cooperate with you in solving any individual problem you may care to submit.

THE CELOTEX COMPANY, H. & V. Aug.
919 North Michigan Avenue, Chicago, Illinois.

Please send me your free folders containing technical data on insulation.
Please include the two auxiliary folders described above.

Name.....

Address.....

City.....State.....

5 Horse Power Century Type SC
Multi-Speed Constant Torque Squirrel Cage Induction
3 and 2 Phase Motor

MULTISPEED

Variable Torque Motors
Constant Torque Motors
Constant Horse Power Motors

Because the power demand of Multi-Speed Motors is in direct proportion to the horse power rating at a given speed, they are economical in operation, and are recommended wherever adjustable-speed motors are desirable—as in fans, blowers, machine tools, wood-working machinery, printing presses, dough mixers and similar apparatus.

They are built regularly for 2, 3, and 4 speeds, with wide or narrow speed ranges like 1800-1200 or 1800-600 down to 900-450 r. p. m. (60-cycle). Special speed combinations available. Temperature rating, 40° C.

CENTURY ELECTRIC COMPANY
1806 Pine St. St. Louis, Mo.
40 U. S. and Canadian Stock Points and more than 75 outside thereof

Century MOTORS

"THEY KEEP A-RUNNING"

GUARD AGAINST *future troubles*

Pipe with ETNA ~

"Etna"—the pipe that has made good for generations—the pipe that is made by master craftsmen who take pride in producing the very highest grade of welded pipe that modern machines and modern methods can turn out—a line of pipe that is world renowned for quality and perfect workmanship.

Every length of "Etna" Welded Steel Pipe is subjected to a long series of tests with instruments of scientific accuracy. The inspections are rigid and uncompromising. Nothing short of perfection is accepted.

That is why "ETNA" is a good name to remember whenever you order pipe.

SPANG, CHALFANT & CO., INC.

General Offices:
CLARK BUILDING, PITTSBURGH, PA.

Sales Offices:
CHICAGO, ILL.
NEW YORK, N. Y.
ST. LOUIS, MO.
PITTSBURGH, PA.
TULSA, OKLA.
LOS ANGELES, CAL.

Welded Mills:
ETNA, PA.
SHARPSBURG, PA.

Seamless Mills:
AMBRIDGE, PA.

ETNA

WELDED STEEL PIPE

INSULITE

the Wood-Fiber Insulating Board

FULL ½ INCH THICK-MEANS

12½% MORE EFFICIENT INSULATION

THAN ORDINARY 7/16 INCH BOARDS

OF COURSE scientific accurate laboratory tests are the only thing to be guided by in the final analysis—but frequently these tests are so technical that only the trained scientific mind really appreciates them.

The above pictured test is simple and understandable for your customers. When you specify or use Insulite on a job show your customers how much more efficient Insulite is. Put a cube of ice on a piece of Insulite over an automatic electric iron. Time how long it takes the heat to go through Insulite and melt the ice. Make this same test with ordinary insulation boards and see the difference.

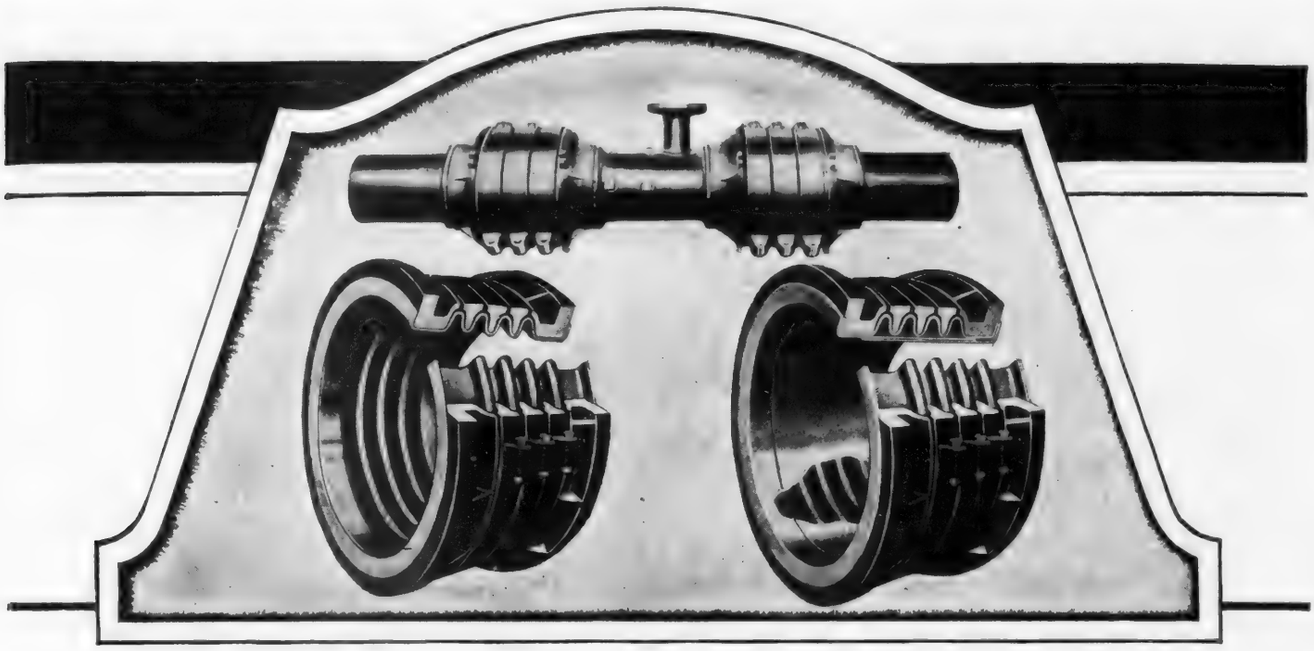
Furthermore, laboratory tests show that Insulite has much greater tensile strength than ordinary insulation boards, and because Insulite is an all wood-fiber product, chemically treated, it is not subject to deterioration.

There are many advantages to be had by using Insulite. Let us send you accurate scientific laboratory data, samples and a free copy of our book — "Roof Insulation and the Prevention of Condensation."

THE INSULITE COMPANY

1204 Builders Exchange, Dept. 12 Minneapolis, Minnesota

FULL ½ INCH THICK --- RESISTS HEAT - COLD - NOISE



KNOWN BY THE COMPANY THEY KEEP

You are buying your first expansion joints. Would it mean anything to know that, for instance . . . . .

Georgia Power Company,
and Edison Electric Illuminating Co., Boston,
and Du Pont Engineering Co.,
and New York Steam Corporation,
and Brooklyn Edison Company,
and Ford Motor Company,
and Gulf Refining Company,
and American Sugar Refining Company,

. . . . are large users of Badger Self-Equalizing Expansion Joints.

The points of superiority of these joints that influenced these companies will interest you:

no maintenance cost
compactness
self-equalizing feature
dependability under pressure

Badger Joints are with good companies. They are the dependable, low-cost joints.

E. B. BADGER & SONS CO., 67 Pitts Street, Boston, Mass.

New York, N. Y., 271 Madison Ave.
Syracuse, N. Y., 404 S. Clinton St.
Minneapolis, Minn., Builders Exch.
Charlotte, N. C., 1408 Realty Bldg.
Denver, Colo., 414 W. Colfax Ave.
Chicago, Ill., 2831 S. Parkway
Cleveland, Ohio, Guardian Bldg.
Cincinnati, Ohio, Union Trust Bldg.
Atlanta, Ga., Red Rock Bldg.
Salt Lake City, Utah, Kearns Bldg.
Philadelphia, Pa., 1500 Walnut St.
Detroit, Mich., 1728 Ford Bldg.
St. Louis, Mo., 3605 Laclede Ave.
Houston, Tex., Sec. Nat. Bank Bldg.
San Francisco, Cal., Sharon Bldg.
Pittsburgh, Pa., Union Trust Bldg.
Montreal, Queb., Can. Cement Bldg.
Los Angeles, Cal., 704 Hollingsworth Building
Portland, Ore., 1000 Buyers Bldg.

BADGER EXPANSION JOINTS

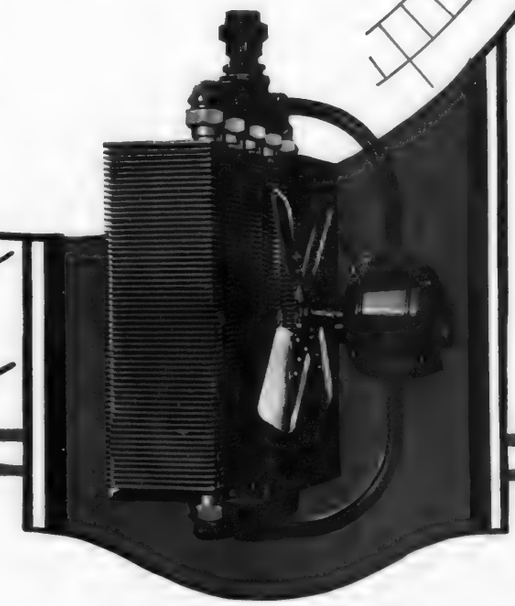
ESTABLISHED 1841 · WEATHER VANE ON FANEUIL HALL · E. B. BADGER & SONS COMPANY · TRADE MARK

Know

The assembled unit is so light that it is usually suspended on the lugs provided for brackets

Always bigger than its job—

To make sure that the Thermal Unit is more than equal to any possible service condition, each unit is subjected to a pressure of 400 pounds before shipment.



It outlasts them all!

Note the cast silicon-aluminum alloy heating section—the unduplicated feature of the Thermal Unit.

the full significance of BALANCE *in a Unit Heater*

BALANCE is what you are looking for in the equipment you buy, specify or install. Until the Thermal Unit was developed you found this element sadly lacking in unit heaters.

The design of the Thermal Unit aimed at the weak point of ordinary construction. As a result, the heating section—ordinarily the weakest part of a unit heater—has the same stamina as any other part of this particularly rugged unit.

Until this unit heater was developed the accepted theory seemed to be that the efficiency of a unit heater's heating section is proportionate to its delicacy!

The Thermal Unit has proved that theory unsound—has proved that a unit heater can be *both durable and efficient.* As a matter of demonstrated fact the efficiency of the Thermal Unit is unsurpassed on the test block, and, still more important, its durability assures this same high efficiency throughout a multiplied service life. This is the combination that you have been looking for—a combination that you will find in no other unit heater.

The heating section, on which the swift acceptance of the Thermal Unit is based, is a special one-piece silicon-aluminum alloy specially formulated for its express purpose. Here is a solid section that will withstand higher pressures than the pipe line can withstand. So ductile is this alloy that the casting is not even damaged by freezing in service. The integral casting eliminates the source of leaks that spell big repairs. To make sure that every heating section is bigger than its job, it is tested to 400 pounds pressure at the factory before shipping.

And the principle of balanced design has gone beyond the heating section. Throughout every part from the liberally rated, quiet motor to the aeroplane design of the louvers there is that fidelity of detail that is characteristic of only the best equipment.

The coupon brings important facts. One of our engineers will gladly show you why the Thermal Unit represents the most modern type of heating unit, in its most advanced form. Don't specify or install another unit heater until you have investigated the Thermal Unit!

THERMAL UNITS CO., *Pershing Road and Loomis Street,* CHICAGO
A subsidiary of the Mechanical Mfg. Co.
Eastern Office: 30 Church Street, New York, N. Y.

THERMAL UNIT
INTEGRAL SECTION
HEATERS
PATENT PENDING

Approved by Investigating Committees of Architects and Engineers

THERMAL UNITS CO.,
Pershing Road and Loomis Street, Chicago.
Please send facts about the Thermal Unit to

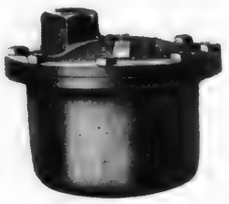
Business name _____

Individual _____

Street and Number _____

City and State _____ H.V.8

"the insurance policy" on this unit heater



Two other types of Armstrong Traps commonly used for draining heaters are shown here

THE Armstrong Steam Trap on this unit heater in the garage of the American Palace Laundry, Buffalo, New York, is "assurance" that it will operate at its highest efficiency at all times.

Armstrong Traps are ideal for heating service since they discharge air entrained in the system as well as condensate. They are light and compact enough to be supported by the connecting pipes, yet they have large capacity without leakage of steam. Made in sizes and types for pressures to 1350 lbs. and temperatures to 750° F.

District Representatives in 42 Cities of the United States and Canada are available both for new installation work or to service present equipment.

ARMSTRONG MACHINE WORKS

Three Rivers, Michigan

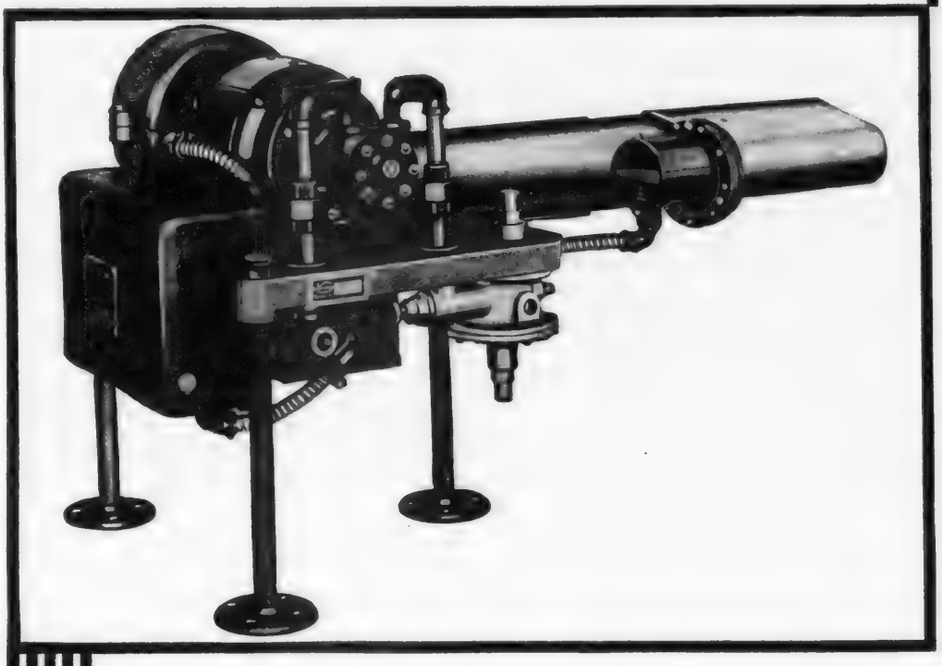
346 Maple Street

District Representative in 42 Cities

H&V8-Gray

LINE UP NOW for FALL SALES

Nu-way



FEATURES

QUIET—A quiet fire with no flame roar.

BUILT IN A SINGLE UNIT—The controls and supply pump, once extra units, are now built in a single unit.

BURNS LESS OIL—Improved combustion makes a hotter fire with less oil.

CONTROL OF ATOMIZER PRESSURE greatly simplified which means efficient and simple control of flame size.

STRAIGHT ELECTRIC IGNITION, tested and proven dependable.

Cool nights will soon be here. People will face again their bothersome heating problems. Conditions will be ideal for cashing in on Nu-Way success. There is yet time to line up on this burner—outstanding in its mechanical features. Prices, sales methods and service are favorable to you. If you are considering Nu-Way—among the oldest in the industry—act now with the peak season just ahead. Write for complete details.

THE NU-WAY CORPORATION, ROCK ISLAND, ILL.

Nu-way

AUTOMATIC OIL BURNER
FOR HOME HEATING

The Only JACKETED BOILER OF *CRACKPROOF* STEEL CONSTRUCTION

THE new Heggie-Simplex jacketed steel boiler—the most modern of residence heating units—has all of the qualities home owners are seeking.

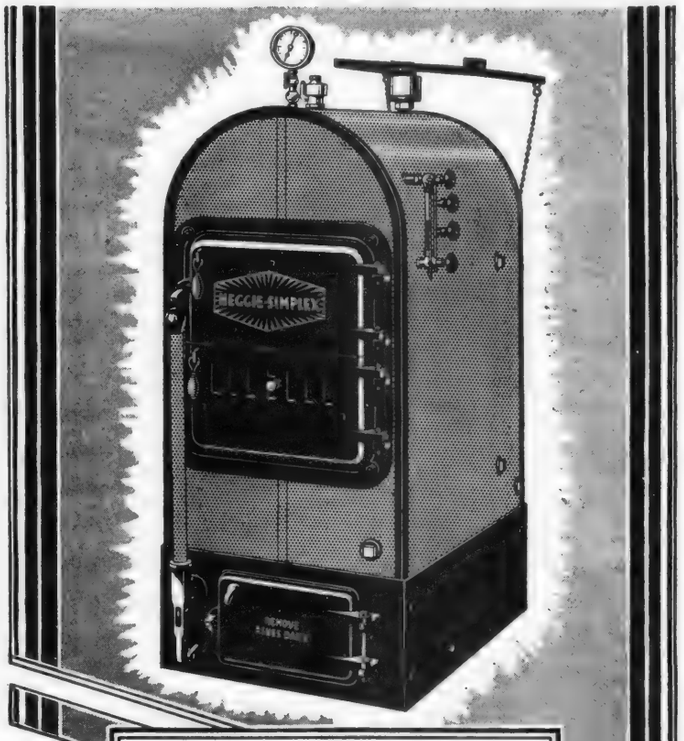
The smart coloring of its durable lacquered jacket—French grey with black trim—is what women want.*

Built of steel, fused by electric welding into one seamless unit, it is crackproof and leakproof.

Its spacious firebox, large heating surface, tubular flues, and unrestricted water circulation make such heating efficiency, as heretofore has been enjoyed only in large buildings, available for the smallest house.

Its large fuel capacity minimizes care. Its extra wide doors and waist-high shaker make attention easy. Its unit construction minimizes installation cost. It is adaptable to any fuel—coal, coke, gas, oil.

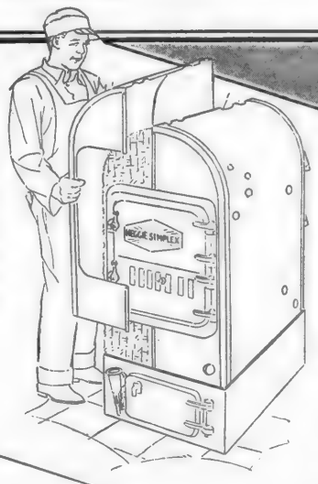
Heggie-Simplex Boiler Co., Joliet, Ill. Representatives in principal cities—telephone and address listed under "Heggie-Simplex Boilers."



*92% of the women who saw this boiler displayed in a variety of colors at a recent exhibit, chose the French grey and black combination. They like its dignified, unobtrusive beauty. They appreciate its practical value in not showing dust.

Rock Wool Insulation

Ready-cut blankets of Rock Wool that only have to be laid in place, are supplied for all sides of this Heggie-Simplex Boiler. This material the Bureau of Standards has shown is twice as valuable as that ordinarily furnished with jackets.



Two-Piece Jacket

Easy and simple to assemble. Two halves form the entire jacket, clamping together without screws or bolts.

HEGGIE-SIMPLEX

STEEL HEATING BOILERS

HEATING AND VENTILATING

formerly

The Heating and Ventilating Magazine

CONTENTS

AUGUST 1929

Editorial 59

Ventilating a Large High School in Duluth ..... *Charles Foster* 60

Gas Heat in New England ..... *J. J. McKearin* 67

Training Heating and Ventilating Engineers in Technical Colleges ..... *Clifford Strock* 71

Panel Heating in Large Commercial Building ..... *A. C. Blackall* 76

Recirculation as Applied to the Butler University Field House ..... *John M. Robertson* 78

Oil-Burner Distribution Data Show Startling Sales Possibilities 82

A.S.H.V.E. Adopts Boiler Manufacturers' Testing Code 84

Proposed Revision of A.S.H.V.E. Boiler Rating Code 90

A.S.H.V.E. Holds Largest Summer Meeting Since 1923 93

Pipe Sizes for Hot Water Heating Systems *F. E. Giesecke and Elmer G. Smith* 93

Report of Committee on Heating and Ventilating Garages 95

B.T.U. Club—Does This Settle the Question of Boiler Pressure? 98

New York City Adopts Certified Heating 100

Semi-Rigid Insulation Is Easy to Install 101

Heating Season of 1928-29 More Severe Than Average 102

Standard Heating and Ventilating Data Sheets 100-A

No. 14 —Welding—Standard Weight Welding Neck Flanges for Standard Pipe.

No. 14A—Welding—Extra Heavy Welding Neck Flanges for Extra Heavy Pipe.

Engineers' Specification Index, Page 154.
Advertisers' Index, 162.

VOL. 26 **NO. 8**

The Future of our Cities

WE talk glibly about the future of our American cities, but how many of us realize what it means? Out in Detroit the other day, they made a survey to determine the future district heating load in the "central business district" of that city. It considered such factors as increase in population, total building cubage, assessed land values and business land area.

On that basis, in 1950, Detroit will double its present population, will more than double its present building cubage in a one-mile circle from City Hall, will more than treble its assessed land values, while 16,000,000 sq. ft. of residence land will be converted to business purposes.

Apply the same ratios to your own city or town and visualize, if you can, "the old home town" in 1950—and that is only 21 years away.

Who said our cities are overbuilt?

A. S. Armagnac

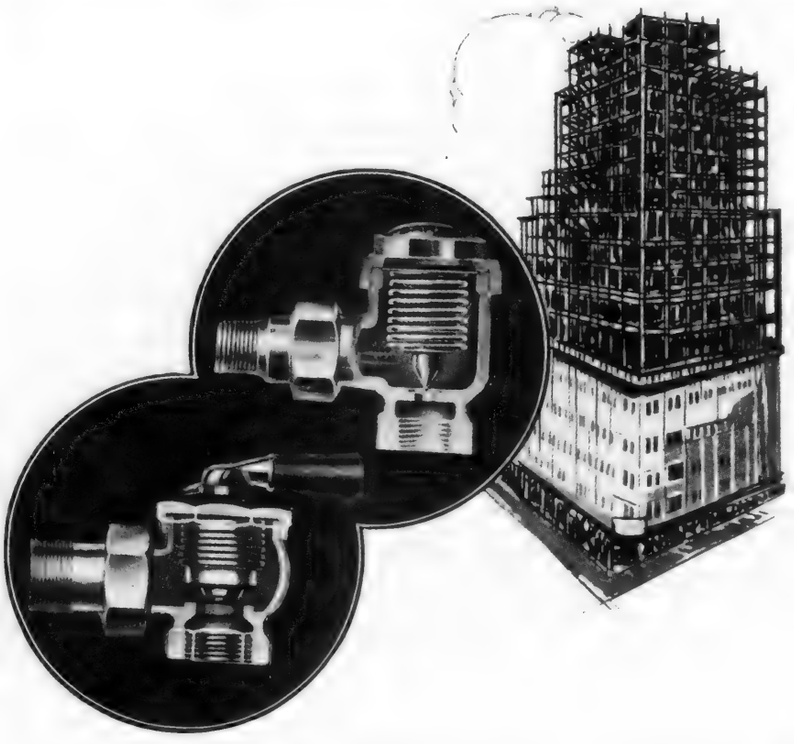
HEATING AND VENTILATING, formerly The Heating and Ventilating Magazine, is published monthly by National Building Publications, Division of National Trade Journals, Inc., 521 Fifth Avenue, New York, N. Y., publishers of The Architectural Forum, Building Age, Good Furniture and Decoration, and Home Builders' Catalog.

H. J. Redfield, Chairman of the Board and Treasurer; Howard Myers, President and General Manager; John Thomas Wilson, Vice-President; James A. Rice, Vice-President; C. Stanley Taylor, Vice-President; Henry J. Brown, Jr., Secretary.

Editorial and Publication Office, 521 Fifth Avenue, New York, N. Y. Branch offices:—Chicago, 75 East Wacker Drive, Telephone Randolph 0743; Cleveland, 514 Swetland Building, Telephone Main 3909; Pacific Coast and South, Blanchard-Nichols-Coleman, Los Angeles, San Francisco, Seattle, Atlanta.

A. S. Armagnac, Editor; Clifford Strock, Assistant Editor; Cliff W. Presdee, Advertising Manager; C. W. Scovel, Jr., Eastern Representative; William F. Steeg, Western Manager. European Representative, W. G. Hollinworth, Somerleyton Road, Oulton, Lowestoft, England.

Subscription Rates—Subscription price $2 per year in United States and Mexico; $2.50 in Canada; all other countries, $3. Single copies, 30 cents.



Wherever Important Buildings Go Up.... SARCO TRAPS *Go In—!!*

YEARS ago, when we first started making Sarco Radiator Traps and Packless Inlet Valves, we had to tackle every engineer on every new building and prove with engineering facts that the Sarco were superior to any other make.

Today it's different. For thousands upon thousands of these Traps and Valves have been installed and are proving their own case in actual operation. Today most engineers and architects know Sarco features.

They know that Sarco Radiator Traps are usually long lived due to the helical expansion element; that they have a perfectly free discharge at all times; that they are noiseless, won't freeze, air bind or water hammer.

They know, too, that the Sarco Inlet Valve is a *true packless* supply valve, without any packing; that it operates by a three-quarter turn of the handle and that the pressure is always even, smooth and regular.

Yes, most well informed engineers know these features, and so today, whenever important buildings go up, the chances are that Sarco Traps and Valves go in.

All features of these modern units described in our Booklets P-110 and P-155. We'll be glad to send copies.

Sarco Co., Inc. 183 Madison Ave New York, N. Y.

Boston Buffalo Chicago Cleveland Detroit Philadelphia Pittsburgh St. Louis

Peacock Bros., Montreal

SARCO Radiator Traps and Inlet Valves

A Good Heating System

HEATING AND VENTILATING

Editorial

HEATING AND VENTILATING announces for early publication a new series of "Industrial Degree-Day" calculations for use in connection with the heating of industrial plants, factories, garages and similar buildings, where temperatures lower than 65° F. are to be maintained. Such a series has been found necessary on account of the fact that the standard degree-day, which is based on an outside temperature of 65° F. does not apply with sufficient accuracy, if a lower basis is used. The heating load, for instance, of a garage or factory to be heated to 50° F. is not 50/65 of the load calculated on the usual degree-day basis. To be entirely accurate, the heating load under any new temperature base should be calculated separately for each locality.

Four years ago, HEATING AND VENTILATING took the initiative in compiling and publishing detailed degree-day calculations for some 500 cities. This effort has been characterized as the most important single contribution in recent years to the science of heating. At the same time the magazine published Iso-Degree-Day, Iso-Oil-Consumption, Iso-Gas-Consumption and Iso-Coal-Consumption charts, which have come into wide use throughout the country. In addition, for the past two years, HEATING AND VENTILATING has published degree-day charts for some nine typical cities, figured on a daily mean temperature basis.

The new series of "Industrial Degree-Days" will round out a service that will make the degree-day system applicable to practically any condition which a heating man will be called upon to meet.

WE ARE happy to announce that, acting upon the request of HEATING AND VENTILATING, the Bureau of the Census 1929 schedule for "Foundry and Machine Shop Products" will be expanded to carry, under the item of "Boilers, Power and Heating," sub-divisions of "Power (high pressure)" and "Heating (low pressure)."

Two years ago, or in August, 1927, to be exact, HEATING AND VENTILATING undertook to secure the acquiescence of the Bureau of the Census in altering the form for the "Census of Manufactures" so as to include more specific information with regard to heating products. The form then in use, for instance, contained an entry for the quantity and value of "Industrial Boilers," but there was nothing to indicate what proportion were power boilers and what proportion were heating boilers. Nor was the number of such units listed or their total capacity. In the case of the monthly surveys and biennial censuses of steel boilers, the data presented covered square feet of heating surface, instead of square feet of radiation capacity.

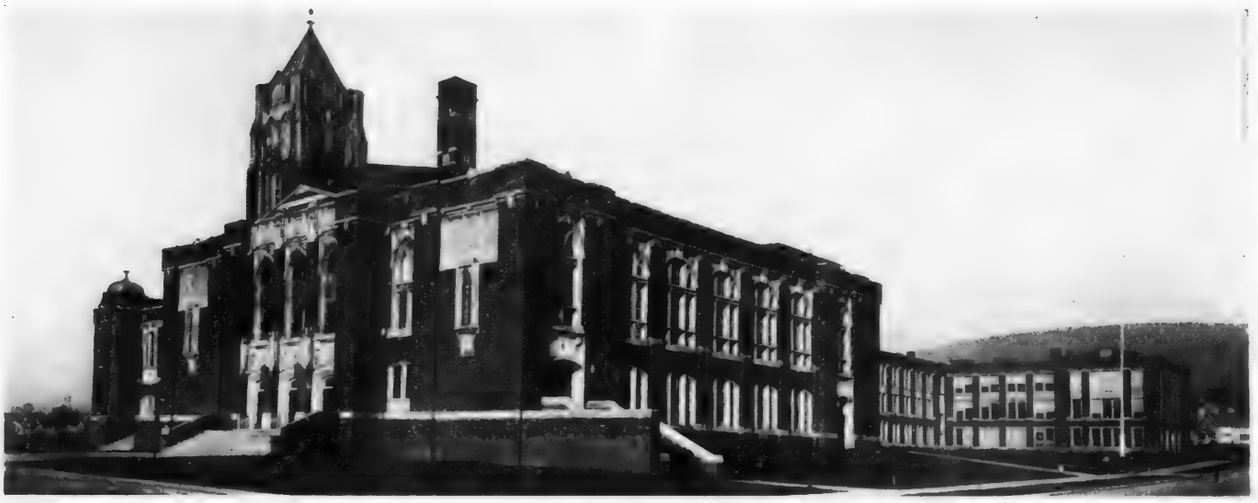
There has long been a crying demand for more exact information than that given in the census. The Bureau of the Census has been most considerate in its endeavors to cooperate to the fullest extent in meeting the needs of the industry. We feel that the industry owes a special debt of gratitude to the bureau and particularly to LaVerge Beales, chief statistician for manufactures, for the action it now has taken, which will be effective with the next (1929) census schedule.

A PROBLEM constantly before the industry is that of securing the appreciation and support of the public for the work of the heating man. As a rule, articles written for public consumption have to be too general in character to do much good.

This year, for the first time, we believe, the Plumbing and Heating Industries Bureau undertook to act as publicity agent for the H. & P.C.N.A. in connection with its recent convention in St. Louis. To tell the story in the bureau's own words:

> "The bureau handled all newspaper publicity for the contractors and that story was sent to all four St. Louis newspapers before the opening of the convention. All four papers printed part of the story on the Sunday previous to the first session. Every day during the four days of the convention, a story was given to the one morning paper and another story to each of the four afternoon papers. In no instance did any of the papers fail to print either all or part of what was given to them as the news of the convention for that day.
>
> "In addition to all this news material, one editorial on the heating contractor and the importance of adequate heating equipment in the home was printed by one of the St. Louis newspapers."

It is hard to over-estimate the importance of this publicity. After all, printer's ink is a mighty weapon. The Plumbing and Heating Industries Bureau has done a good job in St. Louis. The bureau now proposes to act in a similar capacity for wholesalers and manufacturers and, we presume, for the heating engineer as well as for contractors. We can think of no more useful function than this for the bureau to perform and a good time to test the plan is in connection with the forthcoming International Heating and Ventilating Exposition in Philadelphia, next January.



Holstead and Sullivan, Architects — Charles Foster, Consulting Engineer

Denfeld Senior High School, Duluth, Minn.

Ventilating a Large High School in Duluth

by **CHARLES FOSTER**

Consulting Engineer, Duluth, Minnesota

AN outstanding achievement in mechanical equipment and school architecture is embodied in the Denfeld Senior High School, Duluth, Minn. Each division of the school is equipped with a separate ventilating system.

The school is divided into five divisions: Gymnasium, academic, manual training, science and auditorium. The plan of the building forms the shape of an "H." The horizontal bar of the "H" is used as the academic section, one leg of the "H" contains the auditorium and gymnasium section, and the other leg contains the manual training and science section.

Although each division is equipped with a separate ventilating system, the fresh air supply units are grouped in two fan rooms to facilitate their operation. Ventilation equipment consists of six fresh air units supplying a total of 808.26 tons of air per hour and ten exhaust units exhausting 183.6 tons of air per hour. The total electric power load for the fresh air supply and exhaust fans, together with air washer pump motors, is 204 H.P.

With a seating capacity of 2000, the auditorium is so planned that it can be used independently of other parts of the school, although it is so designed that it also can be used in connection with the school itself. The projection booth is designed for two projectors, a spot light, and a stereopticon projector. It is ventilated by means of a separate exhaust fan of the multiblade type with the operating switch in the booth.

Upward Distribution of Air Supplied to Auditorium

The ventilating system in the auditorium originally was designed so that either upward or downward ventilation might be obtained. However, it was found that this was impossible due to lack of funds, and the upward system was installed with the space below the first floor and the furred space under the balcony used as plenum chambers, with mushrooms in the floors. The air instead of being discharged at one point into the plenum chambers is spread equally throughout the chambers so that a uniform distribution of air through the auditorium has been obtained without noise.

Special consideration was given to make it easy to keep the system free from dirt and dust accumulations, which in the past has done so much to destroy the effectiveness of ventilating systems.

Of concrete construction throughout, the plenum chamber under the auditorium is finished with smooth cement. The average height of the chamber is 6 ft. from floor to ceiling. The vent chamber in the attic space above the auditorium is 16 ft. wide, 11 ft. high, and runs the full length of the auditorium. It is plastered with smooth cement.

Fresh air is supplied by an American Blower Corporation full-housed, single-width, single-inlet multiblade fan, belt driven by a General Electric adjustable variable speed slip-ring motor. In connection with the fresh air supply, the other equipment includes an American Blower Corporation air washer, Vento primary and secondary heaters, Nash air-washer pump, Johnson Service Company damper and temperature control. This equipment has a capacity of 50,000 C.F.M.

When the auditorium is filled to

capacity, each person is supplied with 25 cu. ft. of air per min.—an air change every eight minutes. This is accomplished without noise or apparent draft.

A separate city water connection to the air washer was installed for the purpose of cooling during hot weather, inasmuch as Duluth city water has a temperature ranging from 44° to 48° throughout the year, while the outside temperature in July and August sometimes rises to 90°.

Tests made in Duluth during hot weather showed that with city water at 47°, an outside temperature of 82°, and a moisture content of 98 grains per lb. of air, the air was cooled to a temperature of 52° with a moisture content of 57 grains per lb. of air. This air was discharged through long runs of duct work where the air absorbed heat from the building and was discharged through grilles at a temperature of 60° with a moisture content of 57 grains per lb. of air. This is equivalent to 3 tons of refrigeration per 1000 cu. ft. of air per min. The cost of the city water per 1000 cu. ft. of air per min. during this test was 4 cents per 1000 C.F.M. per hr.

Temperature in Auditorium Maintained at 70° in All Seasons

No test has been run on the auditorium unit, but the temperature in the auditorium never goes above 70° at any time, even when the auditorium is filled during the hottest season. In other words a test on this installation will bring approximately the same results as the similar installation.

On this basis, the fresh air supply unit with the auxiliary cold water supply is capable of doing the work of 150 tons of refrigeration at a cost of $2 per hr., and without the cost of the original investment that would be required for a refrigerating plant with its upkeep, depreciation, and other fixed charges.

Heating is accomplished by means of direct radiation and with Vento indirect radiation behind grilles in the entrance lobby.

The building is well insulated with 2 in. cork on the roof and insulating tile in the walls. This, together with heavy acoustic insulating material throughout the inside, makes an ideal installation for effecting economy in steam consumption and making the cooling system effective.

Bleachers and galleries surround the playing floor of the gymnasium, which is 60 ft. wide, 80 ft. long, and 21 ft. high. In the gymnasium section are the showers and the locker rooms for the public as well as for the students. This section also is provided with rooms for the physical directors.

An interesting feature of this section is the method used in ventilating the shower and dressing rooms. In the past, the ordinary exhaust methods which have been used for ventilating such rooms often caused cold drafts.

The ventilating system for this gymnasium has a separate branch air duct leading to the shower and dressing rooms, with a reheater installed in the branch to provide for the higher temperature required for air supplied to these rooms. The air supply is usually at a temperature of 110° in cold weather, but never less than 80°. This heated air is discharged at a velocity of not more than 50 ft. per minute through grilles near the floor line and exhausted through exhaust openings near the floor and ceiling by means of a multiblade exhaust fan.

Ventilation for this section of the building is supplied by a unit consisting of the fan, air washer, and indirect heaters. The motor is an adjustable variable speed slip-ring type belted to the fan. The unit is capable of changing the air in the gymnasium once every 7 min.

In the manual training section are the foundry, machine shop, automobile shop, pattern shop, electrical shop, mechanical drawing and blueprint rooms.

Foundry and Pattern Shop Have Special Exhaust System

A separate exhaust fan is provided for the foundry, and a shavings and sawdust conveying exhaust system is provided for the pattern shop, with hoods at each machine and two floor sweeps for each room. A separator is used in connection with the shavings exhaust system which discharges the refuse to a fireproof vault in the basement.

The upper floor of this section is used for art and music, so that the noisy subjects are segregated in one wing of the building. All rooms are provided with an air change of not less than once in every 6 1/2 min. The fresh air unit includes an air washer.

Heat is distributed by direct radiation with Johnson Service Company control.

In the science section are the biological laboratory with greenhouse, lecture rooms, chemistry laboratory and physics laboratory with lecture rooms. The lecture rooms throughout the building have raised tiers of seats so as to give a clear view of the demonstration table. Each lecture room is provided with a stereopticon lantern, sliding screen, and facilities for darkening the room during school sessions. Domestic arts are included with the science section, providing model kitchen and expeperimental dining rooms, while on the ground floor a large cafeteria is fully equipped to seat 2000 people.

Cafeteria Ventilating System Prevents Odors from Reaching Corridors

Special attention was given to the ventilation of the cafeteria and the adjoining kitchen properly to ventilate this area and to prevent odors reaching the corridors. Air is supplied to the cafeteria through a number of grilles in the furring around the columns supporting the upper floors. These grilles are located near the ceiling.

The air is exhausted through the kitchen by means of a powerful exhaust fan capable of maintaining a strong suction at each hood over the range, broiler, and dishwasher.

Chemistry laboratories are provided with mechanical exhaust ventilation, with exhaust openings at the floor and near the ceiling, and with dampers arranged so that the air may be exhausted from the ceiling or from the floor, or both. The greater part of the fresh air supply is introduced through louvres in the door from the corridors in order to isolate the chemical odors and gases. In addition, chemical cabinets are connected to the exhaust fan to provide local exhaust for each cabinet.

This type of ventilation for chemistry laboratories has proved so

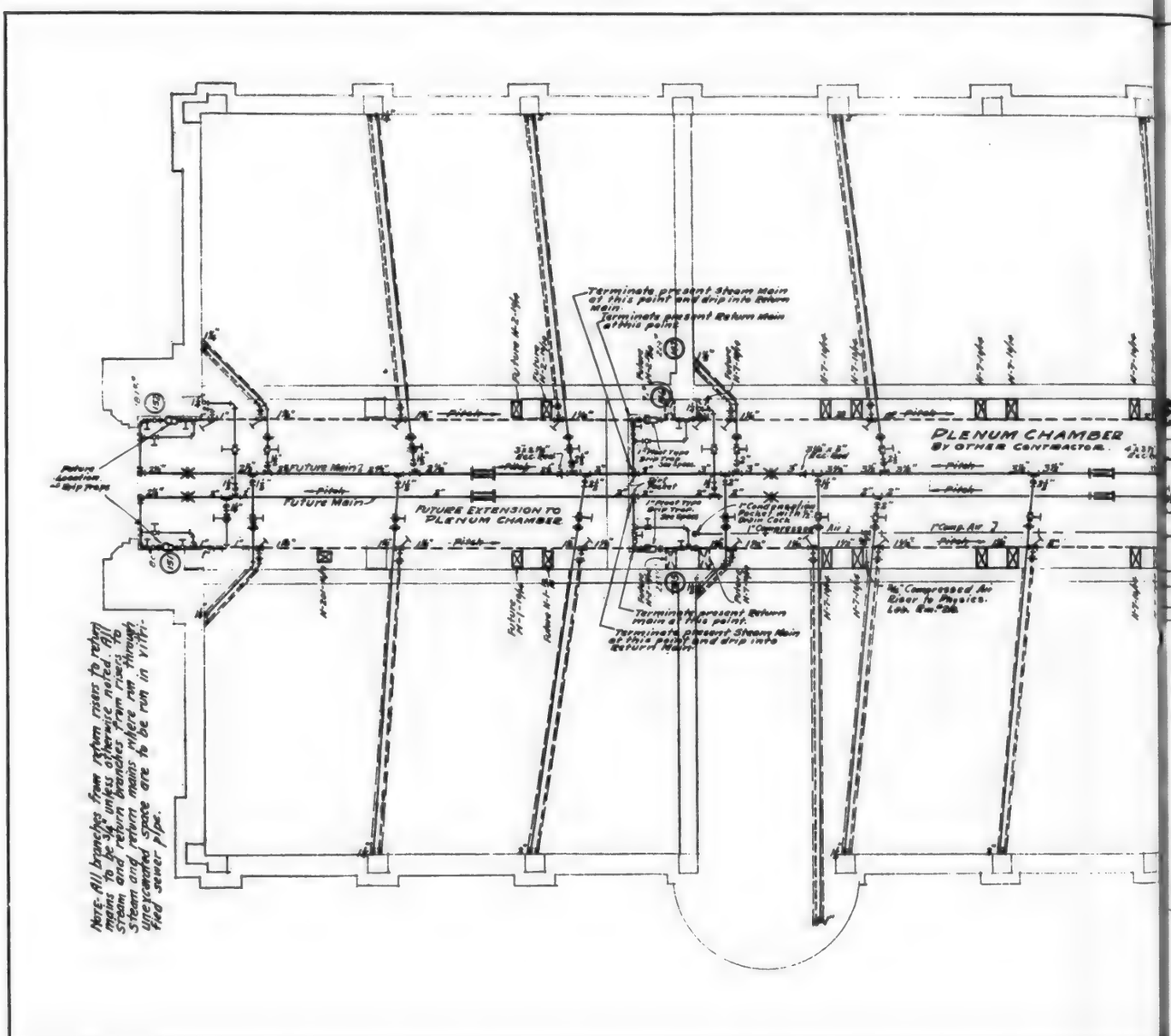
satisfactory that it has become a standard in Duluth for all new school buildings with chemical laboratories.

Air is furnished to the class rooms by two fresh air supply units, including air washers, Vento heaters and Johnson Service Company con-

An interesting feature in connection with the ventilation of the classrooms is that each standard classroom is provided with two fresh air inlets and two vent outlets, so arranged that should it be required to move the partitions the new arrangement will be given proper ventila-

gently drops down to the floor line, without causing a draft. All class rooms have an air change of not less than once in every 5.7 min. This provides for not less than 30 cu. ft. of air per min. for each student.

It was decided to use wall type radiation with shields for taking


PLENUM CHAMBER
BY OTHER CONTRACTOR
FUTURE EXTENSION TO PLENUM CHAMBER
Future Main
Terminate present Steam Main at this point and drip into Return Main
Terminate present Return Main at this point
Terminate present Return main at this point.
Terminate present Steam Main at this point and drip into Return Main
Note: All branches from risers to radiator mains to be 1½ unless otherwise noted. All steam and return branches from risers through unexcavated space are to be run in vitrified sewer pipe.

trol, with the air supply plenum chambers located under the corridors.

The plenum chambers extend full width of the corridors and are 8 ft. in height and are finished in smooth cement. Vent chambers above the top floor corridors are the full width of the corridors and 7 ft. in height.

Supply risers to the classrooms were installed in most cases without bends to facilitate cleaning.

tion. This scheme has been carried out through the academic section and wherever possible in the manual training and science sections.

Fresh air inlets to the classrooms throughout the building have been provided with especially designed deflectors and diffusers, resulting in the air being thrown slightly upward towards the ceiling and spreading out in a fan-shape reaching toward the opposite wall. The air supply

care of the heat losses. This has worked out satisfactorily and is greatly appreciated by the students required to sit nearest the radiators, as the shields eliminate the usual overheating experienced by radiant heat from exposed radiators.

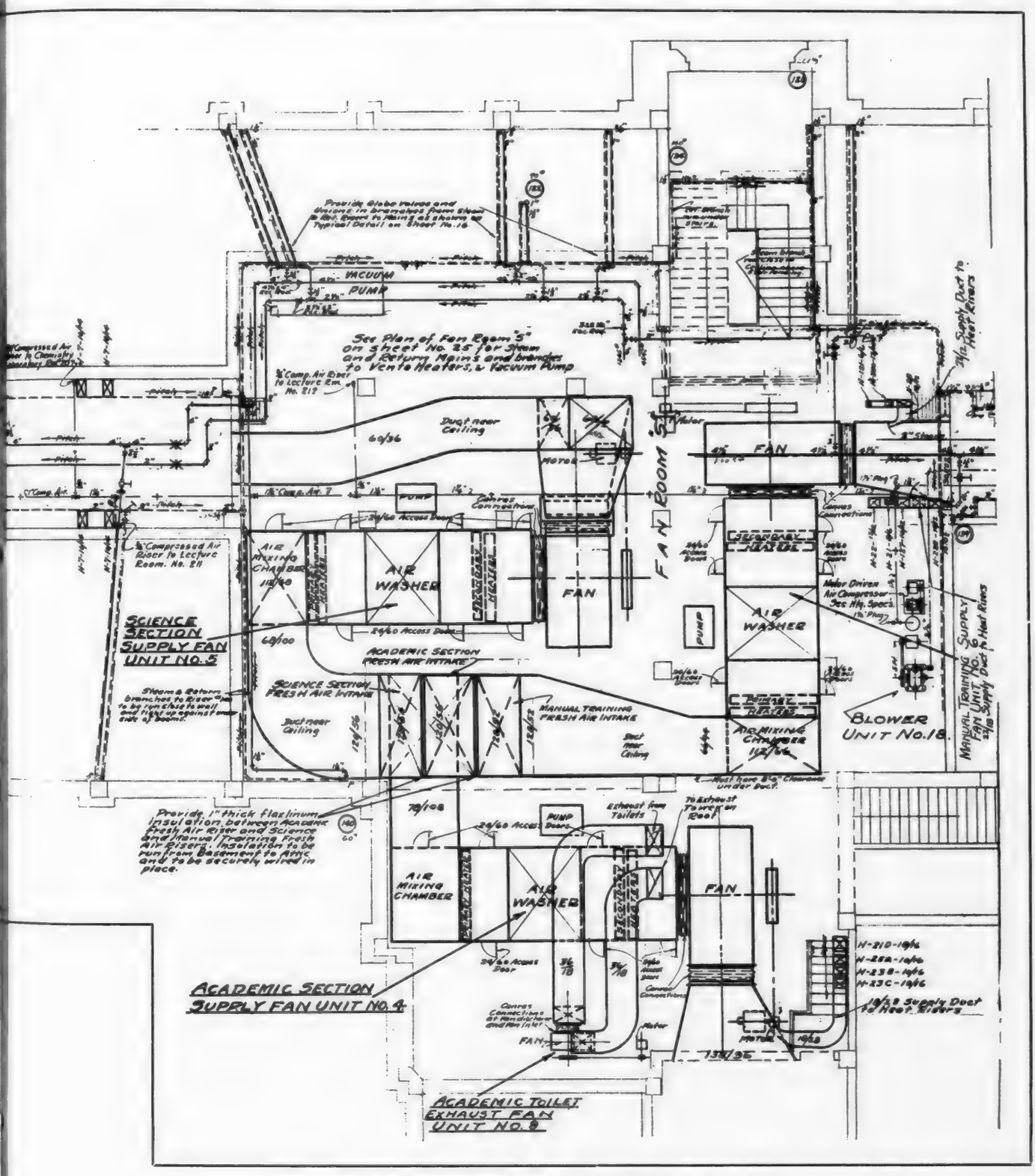
Special attention was given to the foundations and the soundproofing of the various fan units. The large units installed in the basement fan rooms were isolated from the rest of

the building by the use of separate concrete foundations with elastite joints between the concrete foundations and concrete floor or nearby footing. In addition, vibration absorbers were installed between the fans and the concrete foundations. The result is that at no point in the building can any trace of vibration or sound be felt or heard.

For all fans installed above corridors or above any classrooms, full floating foundations were installed, consisting of a concrete slab resting on specially constructed chairs cushioned with hair felt, and spaced according to weight of equipment.

The heating system throughout the building is a two-pipe vacuum system equipped with Warren Webster & Company vacuum specialties. The system includes two Nash vacuum pumps.

A completely equipped plant for


VACUUM PUMP
See Plan of Fan Room "S" on Sheet No. 25 for Steam and Return Mains and Branches to Vento Heaters, & Vacuum Pump
Duct near Ceiling
FAN ROOM "S"
AIR WASHER
FAN
SCIENCE SECTION SUPPLY FAN UNIT NO. 2
ACADEMIC SECTION FRESH AIR INTAKE
SCIENCE SECTION FRESH AIR INTAKE
MANUAL TRAINING FRESH AIR INTAKE
AIR MIXING CHAMBER
BLOWER UNIT No. 18.
Exhaust from Toilets
To Exhaust Tower on Roof
ACADEMIC SECTION SUPPLY FAN UNIT NO. 4
ACADEMIC TOILET EXHAUST FAN UNIT NO. 9
MOTOR

Basement Plan of Science and Manual Training Section
North wing (not shown) is similar and symmetrical with the South wing shown to the left

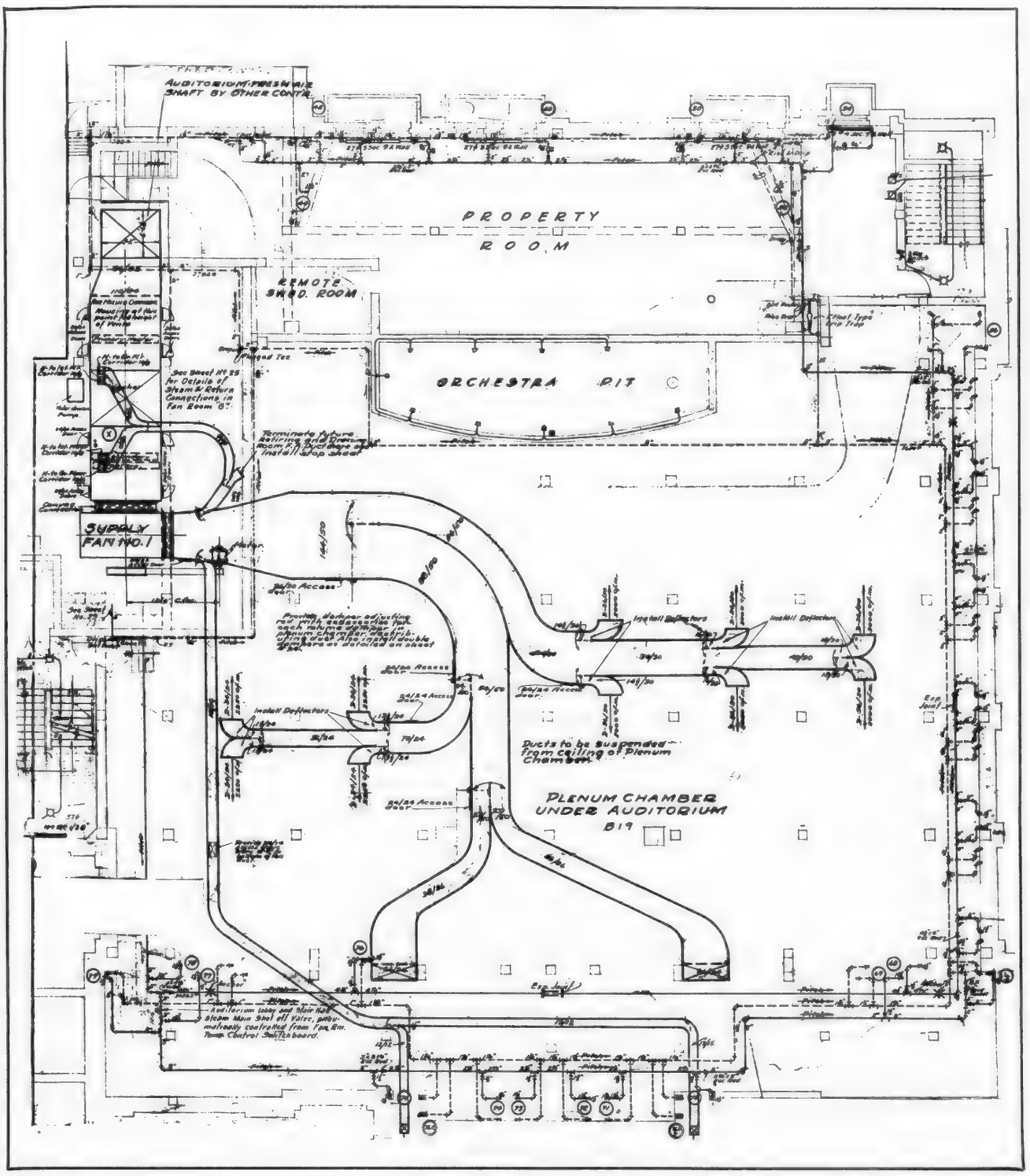
generating all current required for the power and lighting of the building was contemplated in the original plans. The lack of funds, however, made it impossible to follow out the entire program but space is provided for the plant, and it is hoped that this part of the project will be carried out shortly.

Steam is generated in two 300 H.P. Casey-Hedges water tube boilers, equipped with Cokal stokers. The boiler feed pumps are of the turbine-driven centrifugal type.

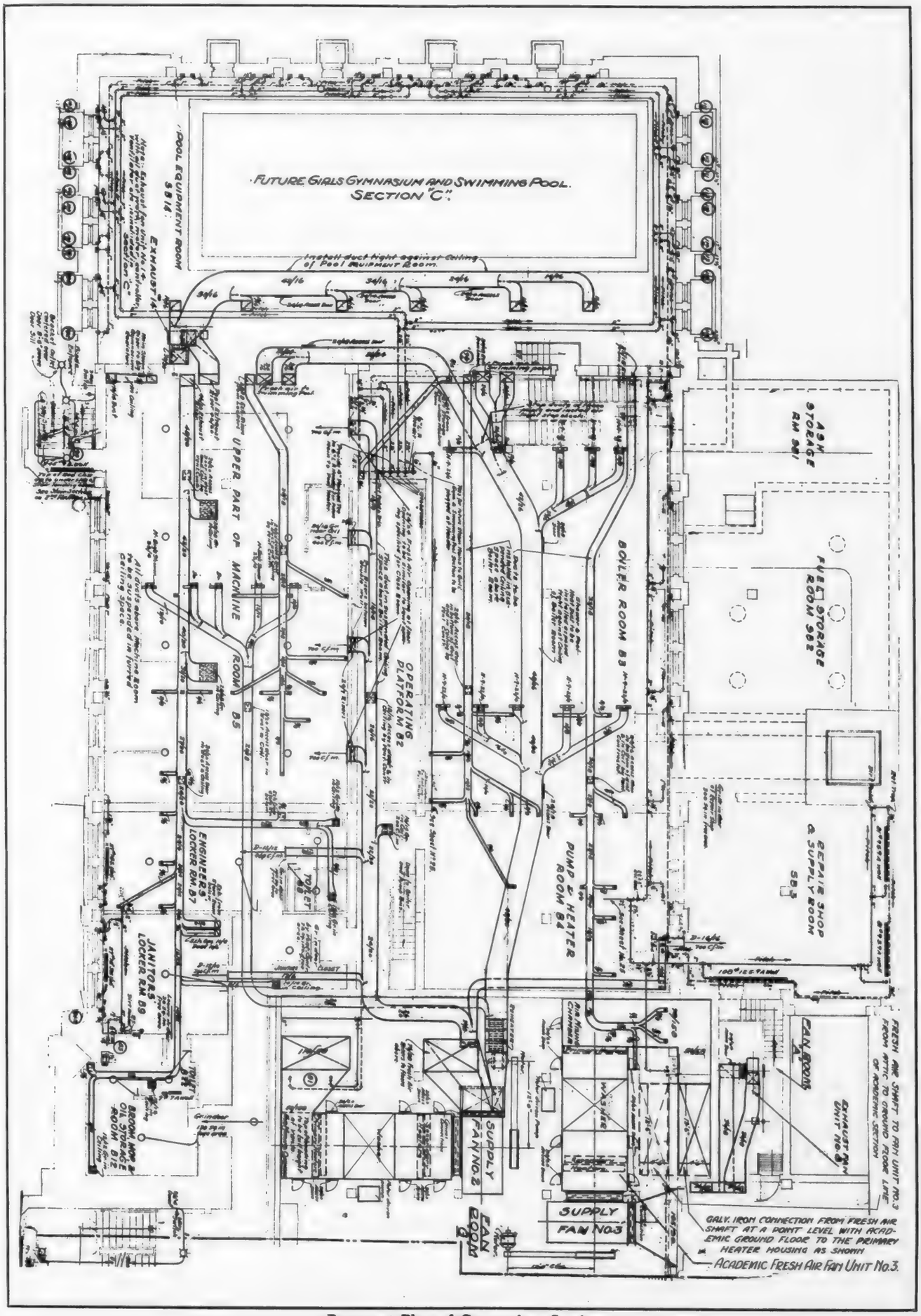
Two Bailey boiler meters are installed to register and record steam flow, air flow, equivalent percentage of boiler rating, flue gas temperature and integrator for the total steam flow. Two Bailey multiple draft gauges are installed in connection with the boiler meters.

The hydropneumatic tank and feed water heater are of Warren Webster & Company manufacture.

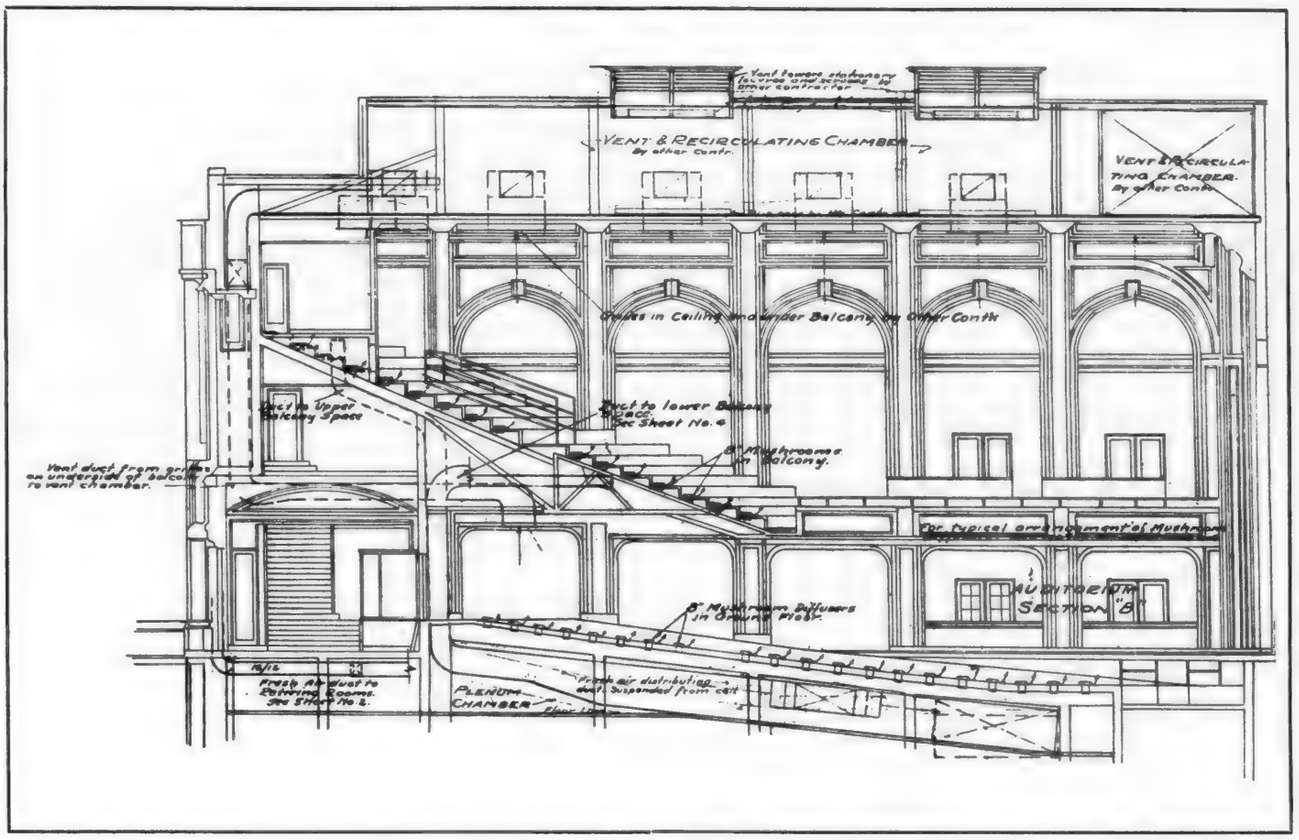
A suspended rail system for conveying coal and ashes, a tram rail



Basement Plan of Auditorium Section


FUTURE GIRLS GYMNASIUM AND SWIMMING POOL. SECTION "C".
POOL EQUIPMENT ROOM 51A
EXHAUST FAN
Install duct tight against ceiling of Pool Equipment Room.
UPPER PART OF MACHINE ROOM B5
OPERATING PLATFORM B2
BOILER ROOM B3
ASH STORAGE RM B4
FUEL STORAGE ROOM 52
REPAIR SHOP & SUPPLY ROOM 53
PUMP & HEATER ROOM B4
ENGINEER'S LOCKER RM. B7
TOILET
JANITOR'S LOCKER RM. B9
BROOM, MOP & OIL STORAGE ROOM B12
SUPPLY FAN No.2
SUPPLY FAN No.3
FAN ROOM
FAN ROOM A
EXHAUST FAN UNIT No.3
FRESH AIR SHAFT TO FAN UNIT No.3 FROM ATTIC TO GROUND FLOOR LINE OF ACADEMIC SECTION
GALV. IRON CONNECTION FROM FRESH AIR SHAFT AT A POINT LEVEL WITH ACADEMIC GROUND FLOOR TO THE PRIMARY HEATER HOUSING AS SHOWN
ACADEMIC FRESH AIR FAN UNIT No.3.

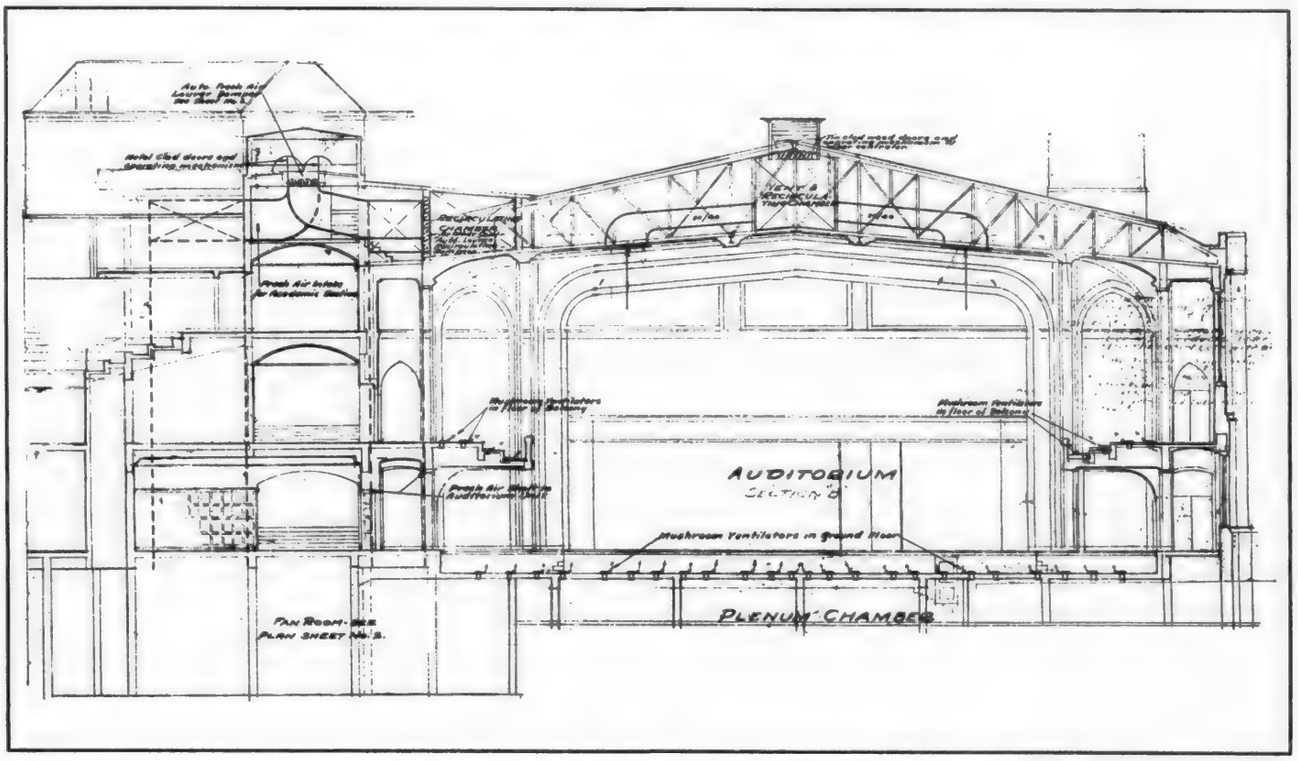
Basement Plan of Gymnasium Section


VENT & RECIRCULATING CHAMBER
By other Contr.
Ducts in Ceiling and under Balcony by other Contr.
Duct to Upper Balcony Space
Duct to lower Balcony Space. See Sheet No. 4
Vent duct from gallery to vent chamber.
For typical arrangement of Mushrooms
AUDITORIUM SECTION "B"
PLENUM CHAMBER
Fresh Air dust to Existing Rooms. See Sheet No. 2.

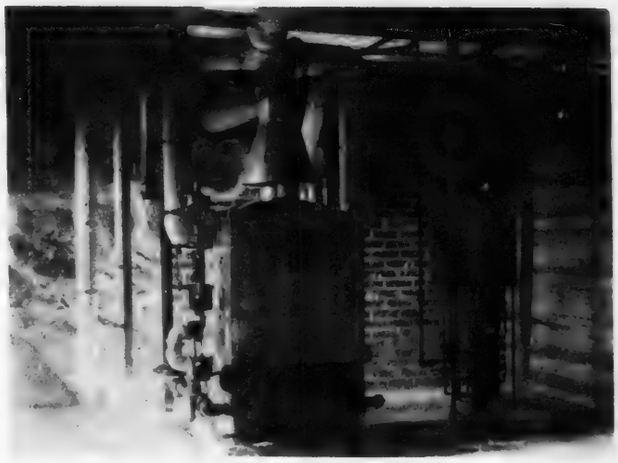
Longitudinal Section through Auditorium Unit

scale, a motor-driven trolley and hoist, and electrically-driven telescopic ash hoist with sidewalk doors and automatic door opening and closing device are included in the plant equipment.

Architects for the building were Holstead and Sullivan, Duluth. The mechanical equipment, including the heating and ventilating layout, was designed by Charles Foster, consulting engineer, Duluth.



Cross Section through Auditorium Unit



Typical Massachusetts Home and Its Gas-Heating Equipment

Gas Heat in New England

by **J. J. McKEARIN**

Lowell Gas Light Co., Lowell, Mass.

IT was in 1922 that certain New England gas companies began an active study of gas house-heating. At this time the successful house-heating efforts of gas companies in St. Louis, Mo., and Denver, Colo., were attracting considerable attention. Artificial gas companies in Portland, Ore., Chicago and Baltimore had also made considerable progress in this field, and previous to this time many natural gas companies had for some years been heating homes with gas.

In the spring of 1923, a few trial house-heating boilers were installed in Haverhill, and installations were also made in other New England companies operated by Stone & Webster, Inc., namely, Blackstone Valley and Fall River. In Haverhill, several were installed in employees' homes and the others were sold to a few men, prominent in business and club life of the community and very friendly to the Gas Company. The boilers were sold to these men with the understanding that they would pay for gas at the regular domestic rate, and, if satisfied at the end of the heating season they would pay for the boilers.

In 1924, active sales work was begun in Haverhill and 39 house-heating installations were sold. In June of that year a special house-heating rate was put into effect. This rate made gas available for house-heating purposes at 75 cents per thousand cubic feet, with a minimum charge of 40 cents per year per cubic foot of rated hourly consumption of installed equipment. In no case could this minimum charge be less than $100 per year.

Since the installation of this house-heating rate and with active selling effort, gas for house-heating in Haverhill became popular, and although the years from 1924 through 1928 were marked by serious losses in the shoe industry, which constitutes Haverhill's major business activity, many gas-fired boilers and furnaces were sold. In 1925, 82 installations were sold; in 1926, 62; in 1927, 39, and in 1928, 42. In other words, at the end of December, 1928, Haverhill had 269 gas house-heating installations on its lines. These installations accounted for 107,297,000 cu. ft. of gas or 18% of the total gas sales.

In speaking of house-heating installations, unless I specifically mention conversion burners, I am referring entirely to gas-fired boilers or furnaces. I will touch on what has been done on conversion burners a little later.

The Pawtucket Division of the Blackstone Valley Gas & Electric Company started active work on gas house-heating in 1923. During this year 20 jobs were sold. The company now has on its lines 246 installations and during 1928, approximately 11% of its total gas sales were those to house-heating customers.

The Woonsocket division of this company sold 17 installations in 1923, and at the end of last year had 147 house-heating boilers connected to its mains. During 1928, gas sold for house-heating amounted to approximately 16% of the total gas sales. The Fall River Gas Works Company entered into the house-heating field with Haverhill and Blackstone Valley in 1923. This company has on its lines, 182 house-heating customers.

Although the Blackstone Valley Company started out with a little different rate, these three companies —Haverhill, Fall River, and Blackstone Valley—now are selling gas for house-heating at a flat rate of 75 cents per thousand cubic feet, with some form of minimum charge.

Other New England utilities became very much interested in gas for house-heating purposes, and, in 1924 and 1925, started to merchandise gas-fired boilers. One of these was the Lowell Gas Light Company, which sold 6 house-heating boilers in 1924,

From a paper read at the New York Regional Sales Conference of the American Gas Association.

and up to January 1, 1929, had 88 house-heating customers. These 88 installations accounted for 6% of the gas sold in 1928. The Lowell rate is a sliding scale rate and averages 77 cents for all gas used in the homes of house-heating customers.

The Portland Gas Company of Portland, Me., began house-heating activities in 1925, and now has 96 house-heating customers. These customers used approximately 8% of the company's gas sales in 1928. The house-heating rate of the Portland Company is 80 cents per thousand cubic feet and this rate applies to all gas used by house-heating customers.

In 1924, the Providence Gas Company of Rhode Island installed 5 boilers. At the end of last December they had a total of 241 installations in operation and the consumption on these units during 1928 represented approximately 3.5% of the company's total output.

The Boston Consolidated Gas Company started house-heating activities in 1926 and during that year sold 177 heating installations. During 1927, 326 installations were sold, and during 1928, 557. At the end of December, 1928, the Boston Consolidated Gas Company had on its line 1060 house-heating customers. From January first of this year to May first, 103 sales have been closed, bringing the total number of house-heating installations, as of May 1, 1929, to 1163. Of this number 120 are conversion units. Approximately 4% of the gas sales for 1928 were to house-heating customers.

In analyzing the work done on gas house-heating by the Haverhill Company, where the percentage of gas sold for house-heating purposes to total gas sales is considered to be comparatively high, one factor seems to head the list of several contributing causes which accomplished this effect.

Low Gas Rate Essential in Obtaining Sales

This factor was: The early recognition of the possibilities of the gas house-heating market and the rapid establishment of a rate low enough to make the selling of this market a possibility. The points I wish to stress are: "Early Recognition," and "Rapid Establishment of a Rate," and although this paper is not intended to discuss rates, there is no question in my small mind that the chief factor in the sale of manufactured gas for house-heating is the rate, and although gas has certain and definite advantages over oil and other fuels, we cannot hope to obtain a volume of gas house-heating business if these advantages of gas over oil and coal are offset by too great a difference in the cost of operation. It was the recognition of this market in 1922, when oil burners were just getting their start in Haverhill and when they were not as silent, quiet, and efficient as they are today, that enabled the gas company to sell some of the most influential men in the city. Today in small New England cities like Haverhill, many of what we might term key men, either heat their homes with gas or oil, or in some cases have purchased house-heating stokers.

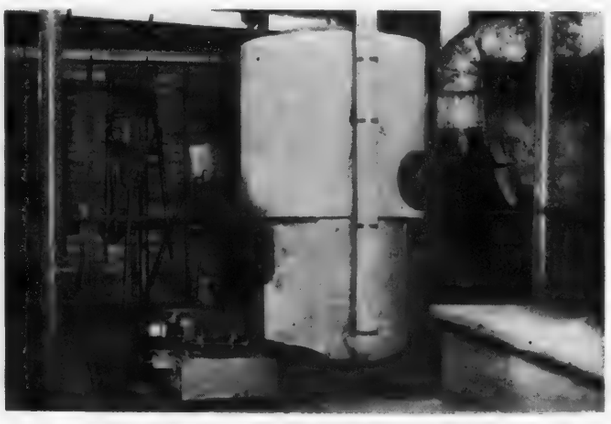
Following close on to number one, I would place the establishment of a competent house-heating department to specialize on the sales and servicing of gas-fired boilers as the second important factor. In the beginning, the sales engineer in charge of house-heating should be given sufficient authority so that he can direct the manner in which complaints and other adjustments are to be handled. The careful selection of the chief house-heating engineer and the men under him is of extreme importance in the success of the undertaking.

The next important step was the organizing of a trained jobbing crew with a capable foreman to install and service gas-fired boilers.

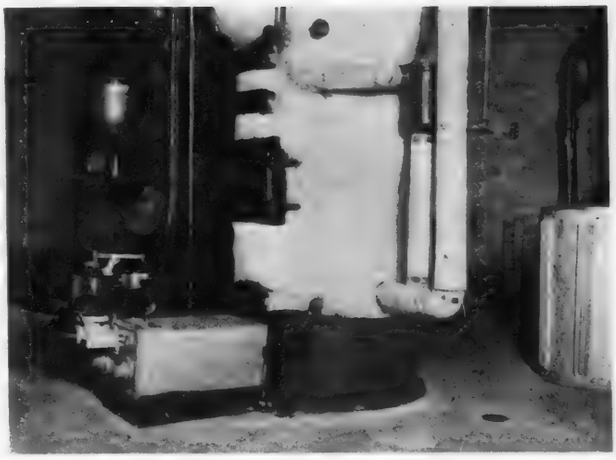
It is a well recognized fact that the best advertisement for any product is a satisfied user, and unless a gas-fired boiler is properly installed and serviced, it is useless to expect volume sales. No appliance can be sold over any great period of time, regardless of how good the sales department is, unless the appliance is installed and its installation followed up by servicing, which is not only prompt, but also carried on by men who thoroughly understand the appliance and its operation. The Haverhill Company used extreme care in selecting a capable foreman to specialize on gas-fired boilers, and the members of the house-heating crew also were carefully selected and trained.

Service given to gas-fired boilers when they were first installed in Haverhill was two-fold; not only did the installation foreman go out on all jobs, but he was accompanied by a trained house-heating engineer, who, also during that first year, made daily calls on house-heating customers, taking gas meter readings, etc.

This Home in Lowell is Heated with a Gas Conversion Unit



Typical Conversion Installation, Lowell, Mass.



Steam Boiler with Gas-Conversion Unit

Modern Gas-Fired Boiler Installation in Lowell, Mass.

He also delivered the gas bills personally. There was not much chance for the customer to become dissatisfied with his gas-fired boiler or his gas bill, because the house-heating engineer was always on the job to answer his questions and assure him that he had made a wise choice. These first house-heating customers were pioneers, and as all pioneers were subject to the critical comments and continual questions of their friends, and in order to stand up under these comments and questions and be enthusiastic users, they needed to have their judgment backed up frequently by the sound reasoning of the gas man.

As an example of encouraging a pioneer, which in this case happens to be a buyer of an appliance which none of her neighbors had purchased, I came across a lady in a certain New England city who bought an electric range and, for the first two days after the range was installed, the demonstrator from the local electric company spent every minute with this housewife. Teaching her how to use an electric range? Yes, to be sure, but more than that, convincing her and reassuring her that she has bought the finest and best method of cooking known to mankind and equipping her with propaganda designed to combat the strongest arguments of her many gas-using friends. This type of service is very effective and of vital importance when selling new uses for gas.

The establishment of the district representative system in Haverhill in 1924, had a very material effect on house-heating sales. The district representatives provide a logical means for obtaining house-heating prospects and our experiences of the last few years are rapidly reducing the selling of gas for house-heating to a matter of prospects.

I believe the present ratio for an average company is 15-5-1. Out of every fifteen prospects, five consent to have their homes measured, and out of the five measurements one is sold. The district representative system, however, saves considerable time for the house-heating salesman, because the district representative not only secures the prospect, but also makes an appointment to have his house measured. The house-heating salesman in this case, when he enters into the situation, has a decided advantage over the house-heating salesman who is making a cold call.

We now come to the last factor in this analysis and I place it last, not because it is less important than some of the above mentioned factors, but because the results obtained from it in the beginning were more of a passive rather than positive help. I refer to the developments of new outlets through the cooperation of the local heating and plumbing contractors.

In order that the contractor would cooperate with us in the sale of gas house-heating, we found that at the start it would be necessary for us to be very liberal in our relations. Although very friendly relations existed between the Master Plumbers Association and our gas company in regard to other appliances and we had a standing plumbers' relation committee, and they had a gas relation committee, nevertheless they had a rather antagonistic attitude toward this new baby of the gas company, which they considered a trespasser on their heating field.

The gas company, therefore, had a meeting with the Master Plumbers Association and explained clearly their position. The company had no desire to enter the heating field as a competitor of the contractor, but it desired to sell gas for house-heating, and in doing this would only sell the gas-fired boiler, deliver it, and connect it with gas. The plumber would make the water, steam, flue and any other connections necessary. The company not only gave the contractors a proposition whereby they could earn a commission if they sold the equipment, but it was also arranged so that they would receive a commission on every boiler they installed for the gas company, regardless of whether they had anything to do with the sale or not. This had a tendency to make the progressive contractor interested in the sale of gas-fired boilers and prevented the lukewarm contractor from knocking this most recent development in house-heating. As the contractors became more familiar with gas-fired boilers, the company each year changed its agreement, so that at the present time the contractors who sell or assist in the sale of the gas boilers receive a large commission, while the contractor who happens to be the choice of the customer to do the job of installing, but who has made no effort to sell the job, is gradually eliminated from any commission and all he receives is his check for the installation. (By plumber installa-

tion of gas-fired boilers I mean all connections except gas.) We believe that every effort and every help, including a liberal commission, should be given the contractor who cooperates with the gas company in the sale of gas equipment, but that the contractor who will not make an effort to sell, should not be paid a retaining fee in order to keep him in a cheerful frame of mind, because if this is done the merchandising contractor will be penalized, for the gas company obviously will not be able to extend to him the liberal discounts which he deserves.

Up to this point, which is really up to the fall of 1928, all effort has been centered on gas-fired boilers and furnaces in the companies in New England with which I am most familiar. In the fall of 1928, however, we reach a new period in the development of gas house-heating in New England which may well be named "The Advent of the Conversion Burner."

Prior to 1928, conversion burners in our territory were not regarded in a very favorable light by the majority of gas companies, New Bedford being an exception, but last year some of the New England companies, notably those who first pioneered gas house-heating, investigated to a great extent the new burners then appearing on the market, and in the late winter of this year, after several months of trial installations in homes of employees and others, a very active and intensive campaign was planned to open in the spring of this year. The results up to the present time have been astonishing. The price for which a gas conversion burner can be sold has entirely eliminated one of the two major sales resistances to gas house-heating, namely, first cost, and as a result we are able to devote all our time and effort to overcoming the other major sales resistance, cost of operation.

It was really well into March before two of the first companies in New England, who started to merchandise conversion burners, namely the Haverhill Gas Light Company and the Lowell Gas Light Company, got their conversion burner program under way and then their house-heating organization was by no means perfect, because it was necessary to train additional house-heating salesmen in a very short space of time. Results, however, have been exceptionally encouraging. Lowell, which was not one of the companies which entered the house-heating field early in its development, sold 15 house-heating boilers during 1928, and during the month of April, 1929, 22 conversion burners and 2 gas-fired boilers were sold. With the adoption of the conversion burner, Lowell expects to sell 125 house-heating installations during 1929, compared to 15 in 1928, and up to the middle of May already 45 house-heating installations have been sold this year.

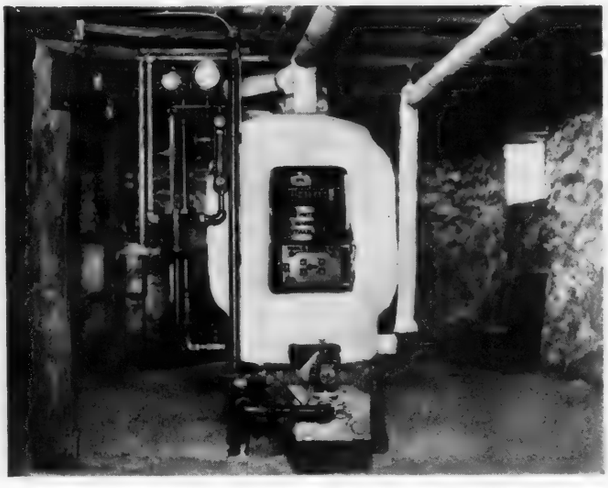
Haverhill and also Fall River report similar situations and it must be remembered that these towns, Lowell, Haverhill and Fall River, have been hard hit by poor business conditions—Lowell and Fall River by depressions in the textile industry, and Haverhill continually upset by labor trouble in the shoe industry.

Haverhill was outstanding with a total of 269 house-heating installations on its lines at the end of December 31, 1928, but up to May first this year, 31 installations have been sold of which 29 were conversion units. A new field is opening itself to the gas industry and conservative New England aims to be among the leaders in that field.

It would be decidedly unfair at this time to leave the question of conversion burners in New England without a few words of praise to the New Bedford Gas Company and Mr. Morgan who was very instrumental in awakening many New England Gas Companies to the possibilities of conversion burners by the excellent selling job they did on these burners in New Bedford in 1928, and by the able presentation of his experiences which Mr. Morgan gave at the New England Gas Association Convention in Boston last February.

The New Bedford Company started to sell gas house-heating in 1926, during which year they sold 48 installations. Up to May 1, 1929, this company had installed 268 house-heating jobs of which 80 were conversion units.

When we first started gas house-heating in Haverhill, we estimated that at the end of 1935 there would be approximately 500 house-heating installations in operation in this city. At the present time (up to May first) there are already 300 installations, including conversion burners.



Completely-Equipped Gas-Conversion Installation in a Massachusetts City

Note Cleanliness of this Basement Equipped with Gas-Fired Boiler

Students Recording Data on Unit Heater Tests, Carnegie Institute of Technology

Training Heating and Ventilating Engineers in Technical Colleges

by **CLIFFORD STROCK**
Assistant Editor, Heating and Ventilating

"DEMAND on the part of manufacturers for students who have specialized in heating and ventilating has been steady and heavy. For some years there have been more calls for young graduates than we have students."

The above statement was made by a member of the faculty of one of the largest engineering universities in the country, a school which has been among the outstanding colleges in its attention to heating and ventilating.

In view of the fact that every year over 23,000 students matriculate at engineering universities, and the fact that in many branches of business the young college graduate is forced to take almost any job at a low salary, it is significant that the mechanical engineering graduate who has specialized in heating and ventilating has no trouble in locating a worthwhile position.

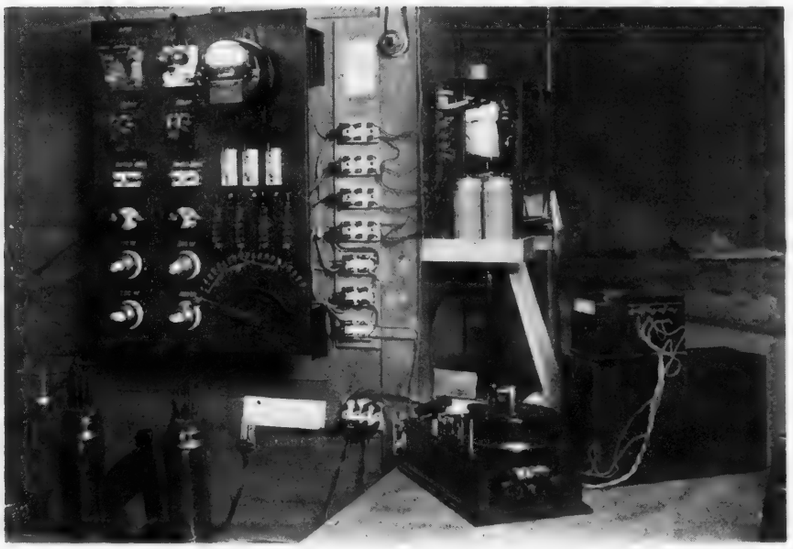
An instructor in charge of the heating and ventilating work at another university reports that, for the class of 1929, the requests for graduates in that option averaged three for every student.

Demand for young heating and ventilating engineers primarily is from the manufacturer rather than the contractor. The latter, it seems, prefers to employ experienced engineers or, in the case of small contractors, train estimators who have worked in the shop and show aptitude for engineering work.

Outstanding among the universities teaching heating and ventilating are: University of Kentucky, University of Minnesota, University of Wisconsin, New York University, Carnegie Institute of Technology and Purdue University.

With one exception, all of these schools and four others are active also in research work in cooperation with the American Society of Heating and Ventilating Engineers. Research is carried on by graduate students rather than undergraduates, while the colleges listed above are active also in undergraduate instruction in heating and ventilating.

A three-year course in heating and ventilating was organized at Carnegie Institute of Technology in 1915 and changed to a four-year course in 1919. All freshmen engineers take the same studies and heating and ventilating students specialize in their sophomore year. The course may be roughly divided into three major themes. The first includes fundamentals taught in the freshman and sophomore years. The second group consists of banking and credits, accounting; law, employment problems, etc., which are taught in the junior and senior years. The



Control Board for Heat Transmission Experiments, University of Minnesota

third, or technical group, is given in the sophomore, junior and senior years.

Training at this university fits the students especially for the contracting field, and the study of applied fundamentals of operation and adaptability of equipment for given purposes is stressed.

Typical heating systems are operated so as to give the student a thorough understanding of circulation, water flow, condensation and related subjects. In the junior year, ventilation and air conditioning are studied and the students lay out complete systems for a school house and an industrial plant. A course known as equipment testing is included in the junior year, covering the operation and recording of performance data on tests of radiators, boilers, fans, traps, filters, cabinet heaters, temperature controls, etc.

In the senior year, a complete layout of a heating and ventilating system is required, including specifications and itemized estimated costs. The texts used are the "Guide," Hoffman's "Heating and Ventilating," HEATING AND VENTILATING, "Plumber's Handbook," A.S.H.V.E. Transactions, various trade papers and mimeographed sheets.

Professor S. E. Dibble is in charge of the course and holds the Ahren's Chair of Heating, Ventilating and Plumbing, endowed with $100,000 by the Standard Sanitary Manufacturing Company for this purpose.

At Wisconsin, an undergraduate course, under the direction of Prof. G. L. Larson, repeated each semester, is open to all engineers who have had the proper prerequisite courses in steam engineering. An advanced course is open to students who have completed the first course. Allen and Walker's text is used, supplemented by the A.S.H.V.E. *Guide* and manufacturers' catalogs as references. Next fall it is planned to discontinue the text and use the *Guide* and manufacturers' catalogs exclusively.

Each student is given the plan of a house in triplicate from which he calculates heat loss calculations and makes complete layouts of a warm-air, a vapor and a water-heating system. When completed, he has three complete sets of plans with three different heating systems for the same house. The projects of different students are varied by changing the type of construction by specifying storm windows, weather-stripping and insulations of various coefficients.

Upon completion of the three sets of heating plans, the student is given the plans of a two or four-room school for which he lays out a complete heating and ventilating system following the ventilating requirements of the ventilating code of the State of Wisconsin. Inspection trips are made to various buildings, schools and theatres in Madison to study the various systems in these buildings.

The advanced course is in the nature of a special problem in which the students are given the plans of large buildings, usually schools, and are required to prepare complete heating and ventilating layouts and specifications for the installation.

A laboratory course in heating and ventilating will be given for the first time next year.

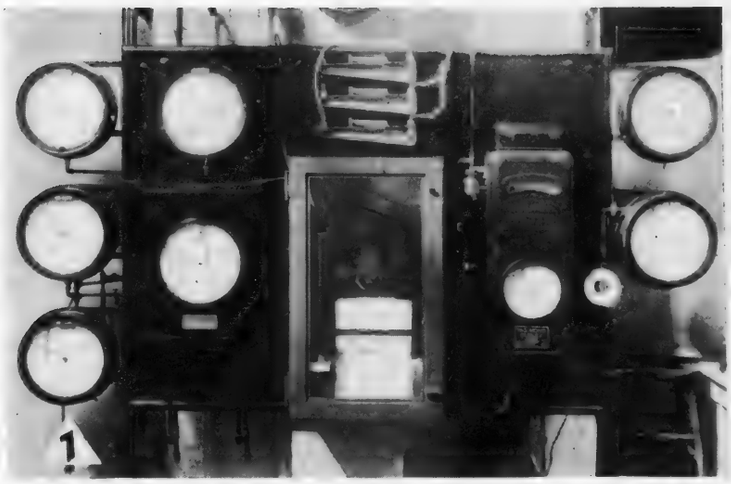
From 15 to 20 students take the course each year and a large percentage of these men enter the heating profession upon graduation. There is a rapidly growing demand from contractors and manufacturers for men trained in heating and ventilating and the demand for these men is greater than the supply.

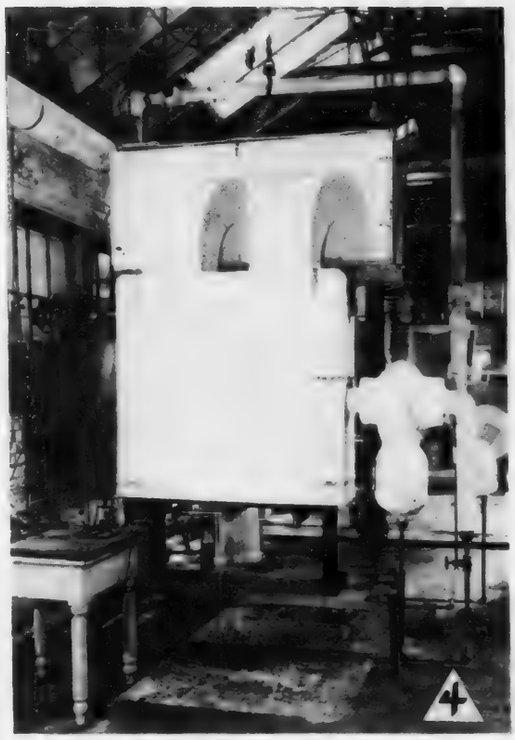
There are 25 enrolled for work in the three-year certificate course in heating and ventilating at New York University, given by the faculty of the evening engineering division, which includes Prof. A. A. Adler, consulting engineer, Prof. R. D. Morrill, W. R. Zuhlke and M. C. Giannini. This course is taken by men engaged in heating and ventilating work with many of the large organizations in and around New York. Quite a few of the students already hold engineering degrees from other colleges.

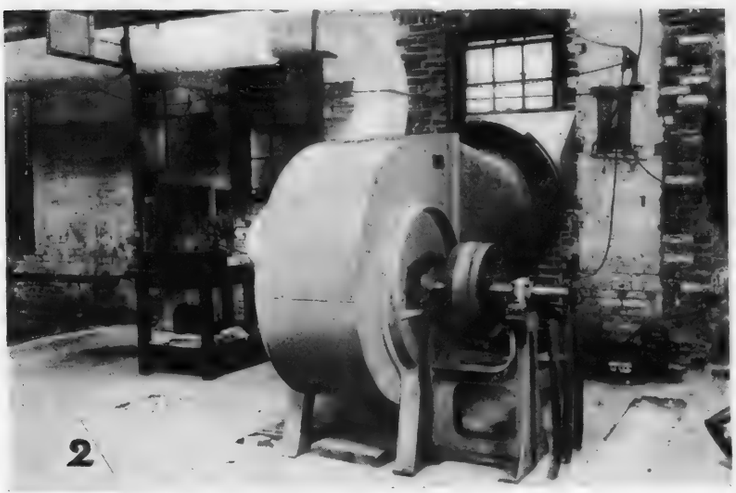
Regular work in the College of Engineering for day students does not include a definite course in this subject, such as is given at Carnegie Institute of Technology. There are, however, two single courses in the senior year of the mechanical engineering curriculum, one covering "Heat Transfer Apparatus" and another "Power Plant Economics," both of which deal with heating and ventilating problems. The first course deals with the fundamentals of calculating heat losses and the latter, their application to specific installations. Enrollment in these courses numbers 18.

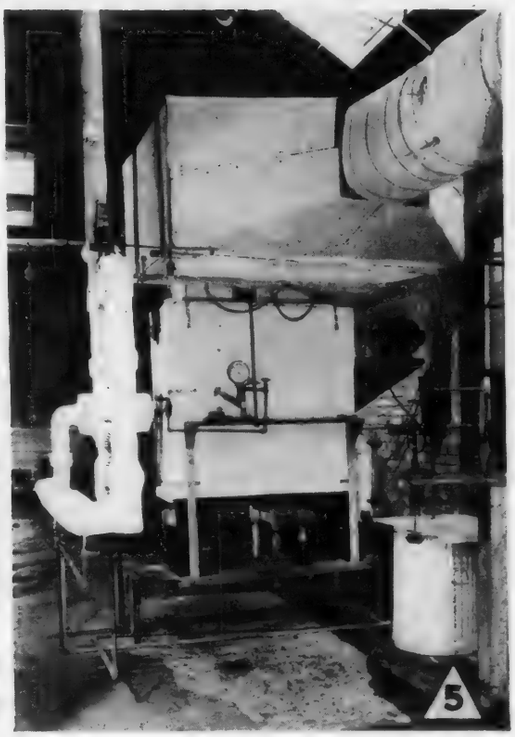
New York University is planning the establishment of a regular four-year course in the day college, leading to an appropriate degree—the title of the course to be "Plumbing, Heating and Ventilating" — quite similar to that now given at Carnegie Institute of Technology. If this plan is carried through it will involve a money investment of about $700,000 and include a complete building devoted entirely to this purpose.

At Purdue University undergrad-









Views of Heating Laboratory, College of Engineering, University of Kentucky, Lexington

1—Instrument board in heating boiler laboratory.
2—Rear view of unit heater set-up
3—House-heating boiler laboratory
4—Unit heater test set-up
5—Forward end unit heater testing set-up

uate courses in heating and ventilating constitute one of several technical options available to senior students in mechanical engineering. Under this method of offering the courses, a student chooses that option in which he would like to take senior courses. He then enrolls in a series of four courses in heating and ventilating, two of which are taken concurrently during the first semester, while the other two are taken concurrently during the second semester. In each case the concurrent courses are closely related and in each case one course is devoted to a consideration of theory, principles, apparatus and short problems using classroom and lecture methods, while the concurrent course is devoted to practice in the applications of the subject material to problems. The practice problems, or projects, closely parallel the subject matter of the classroom course. Students who elect the heating and ventilation option spend two hours per week in the classroom and two afternoons each week either in the drafting room or in the laboratory. This time schedule continues for the whole senior year. Classroom and project work is in charge of Prof. C. H. B. Hotchkiss.

Classroom courses begin with textbook material which is handled by the traditional method of assigning parts. The text-book material is supplemented with lecture material as required. The consideration of this material aims to accomplish two purposes:

1. To give a thorough grounding in the essentials of the subject, and
2. To let the students become familiar with the sources, form, and location of existing engineering data on the subject.

After this more or less standard text material has been covered, supplementary material is presented covering the history of the growth of our present practices both in heating and in ventilating buildings. After that, summaries and descriptions of research projects are presented describing the apparatus used, the procedures followed, and the results obtained. Where data resulting from such work appear in the *Guide* their experimental and research background are explained. This part of the work closes by attempting to give a picture of the heating and ventilating field. The activities of the governmental bureaus, the A.S.H. & V.E., and the trade associations, are explained so far as they directly affect technical matters. Census data of various kinds are presented showing the value of the products, the relative position of the heating and ventilating industry in volume of production and sales, number of employees, number of establishments, etc. Data are presented showing trends in heating fuels as indicated by census, and other figures.

Drawing-room and laboratory courses are conducted by the project method. In these courses jobs are laid out which parallel the classroom work. Some consideration is given to warm-air, steam and hot-water methods of heating small buildings, and typical drawing-board layouts are made. Afterwards a project is undertaken which involves a larger building. No attempt is made to design complicated or unusual systems as it is felt that principles are of more importance to students than are practices which can best be obtained by engaging in commercial work after graduation. Each project is roughly estimated for cost, and stress is placed on approaching design problems from a cost viewpoint. Laboratory work is introduced during these courses illustrating the principles of the measurement of air quantities and velocities, heat and temperature, and ventilation.

F. Paul Anderson, dean of the College of Engineering, University of Kentucky, has stated that Kentucky has endeavored for years to

Carnegie Tech Students Testing Steam Pipe Sizes

escape the fallacy of trying to make skilled engineers in college. Consequently, no attempt is made to train undergraduates specifically for positions in the heating and ventilating industry, but rather the students are given a broad training in the fundamentals of engineering. The industries later can give to the embryo engineer enlightenment and skill in their particular work. This view is held by many others in similar positions, an example being Dean A. A. Potter of Purdue University who has proposed that all engineering students be given the same course.

However, at Kentucky, the young engineer is brought in contact with subjects related directly to heating and ventilating. The student is directed in experiments in the heating and ventilating laboratories. Routine training is given in laying out radiation and duct work also, but all of such training is done from the standpoint of teaching fundamentals and not with any idea of making the student an expert in a single detail. At Kentucky, as at other schools, the demand for graduates is far in excess of the supply.

Work in heating and ventilating at the University of Minnesota is partially separated from the other courses and partially combined. With the mechanical engineers it starts in the junior year with a course covering the general principles of heating and ventilation. This is a lecture and a recitation course taken by about 40 junior mechanical engineers, and correlated with the laboratory work. For the past years we have been using the A.S.H. & V.E. *Guide* as a text, supplemented by lectures and mimeographed notes. Laboratory work, with which this course is correlated, consists of tests to determine the flow of air in ducts by both the pitot tube and anemometer, tests to determine the power and other characteristics of centrifugal fans, tests of heat transmitting properties of radiators, pipe covering and other furnaces, tests to determine the heating efficiency of boilers, and tests on the ventilating equipment in large auditoriums.

This course is followed by more advanced work covering the specific assignments to advanced students in such fields as warm-air furnace work, ventilating problems, central station heating and any of the allied problems of heating and ventilating. These courses are taken by groups ranging from six to twelve students. In addition to this there are special laboratory problems in which the student may select specific problems, these courses being taken by eight or ten students. The courses are given by Prof. F. B. Rowley.

In spite of the demand for graduates who have specialized in heating and ventilating, many students who have taken such options accept positions in other fields. A professor of mechanical engineering at a mid-western university ascribes this to the fact that most of the employers in the industry are not nearly so well known to the undergraduate as firms in other lines, such as power plants, utilities, large electrical manufacturers, motor car manufacturers, etc. Second, he believes that although the positions offered by firms in the heating and ventilating industry have great possibilities, the initial salary is smaller than that offered in other lines. While the initial salary may not be important in the long run, it certainly does loom large in the student mind.

HEATING AND VENTILATING *for September will contain a complete tabulation of the various courses in heating and ventilating offered by universities in this country, including courses given by correspondence schools for those seeking training in heating and ventilating engineering.*

District Heating in St. Louis

A comprehensive analysis of consumer classes and steam consumption in St. Louis is indicated in the accompanying table taken from a paper presented before the St. Louis Section, A.S.M.E., in which J. E. Hillemeyer discussed district steam heating in down-town St. Louis. Mr. Hillemeyer is manager of the steam heating department, Union Electric Light and Power Co., St. Louis.

AVERAGE ANNUAL STEAM CONSUMPTION OF VARIOUS TYPES OF BUILDINGS IN ST. LOUIS BASED ON NORMAL YEAR

Type of Business	Cu.Ft.of Contents	Sq.Ft.of Radiation	Annual M.lbs. Steam	Lbs. Cu.Ft. Year	Lbs. Sq.Ft. Year	Ratio Rad.to Cubic Content	Hot Water Equiv. Rad.	Hot Water Lb. Cu.Ft.
Hotels	12,292,010	221,879	76,983	6.61	486	74.75	39,757	3.065
Garages	2,732,028	27,448	9,575	3,90	465	127.35	6,376	
Furniture Houses	4,354,150	26,088	8,357	2.42	345	153.70	0	
Billiard Halls	34,440	443	543	15.78	1250	77.74	0	
Department Stores	14,590,184	147,083	26,364	2.18	215	94.55	2,927	
Refrigerating Company	283,451	2,306	2,105	7.44	900	123.20		
Theatres	2,604,561	42,449	9,265	4.16	303	66.51	300	
United States Custom House	3,975,356	35,165	13,714	3.45	390	113.10	297	.415
Warehouses	13,146,305	86,227	24,522	2.18	301	138.40	0	
Wholesale Houses								
Office Buildings								
Small Buildings								
1-pipe up-feed	1,831,794	27,810	10,150	5.44	353	67.58	0	.883
Large buildings								
1-pipe down-feed	24,918,165	255,314	122,436	5.62	450	80.41	7,746	.636
Large building vacuum								
2-pipe down-feed	35,082,178	599,739	147,439	4.54	287	72.60	20,713	.746
Banks	3,659,696	45,090	17,844	5.54	433	85.60	544	.526
Small Stores								
1-pipe up-feed	976,542	12,054	5,356	4.59	371	90.25	0	
2-pipe up-feed	451,011	5,815	3,263	7.59	555	74.16	0	
Building open long hours	229,269	3,153	1,338	5.84	456	70.83	125	
out of line - 713 Chestnut	12,775	314	170	13.30	542	40.68	0	
Loft & Misc. Buildings								
1-pipe up-feed	4,151,409	33,701	14,815	5,43	408	96.60	0	
2-pipe up-feed	1,087,391	9,317	5,206	4.10	490	111.71	0	
1-pipe down-feed	62,933	1,026	623	9.90	606	61.34	0	
Printing								
Small Printing houses	2,069.971	18,287	7,188	4.29	454	91.10	320	
Large printing houses	2,451,304	34,462	17,454	7.62	616	78.07	574	6.24
Women's and men's furnishings								
Women's furnishings	3,526,560	28,844	9,992	3.73	353	116.2	0	
Men's furnishings	1,414,342	10,572	4,395	3.18	408	129.5	0	
1 Bldg.htg. & H.W.-Kline's, 606 Washington	858,734	7,012	1,834	2.14	258	121.0	136	
Hot Water only - barber shop	-	-	312	-	-	-	234	

Total number of customers--- 160. Total steam sold 737,198,700 lbs.
Total radiation 1,987,297 sq.ft. Total cubical content 143,459,881 cu. ft.

NOTE: Department stores and a refrigerating company used for cooking and hot water, respectively 0.747 and 17.4 lbs. per cu. ft. The large consumption of the refrigerating company was due to use in the refrigerating process. Steam was used in the furniture houses for heating and hot water service. A hot water system of heating is used in the U.S.Custom House.

View of Imperial Chemical House, London, During Construction, Showing Panel Heating System

Panel Heating in Large Commercial Building

by **A. C. BLACKALL**

A HUGE commercial building, known as Imperial Chemical House, was opened in London recently as the headquarters of Imperial Chemical Industries, Ltd., the great British chemical combine. The building is heated by the Crittall patent panel system.

Ring mains encircle the basement of the building and risers ascend to various floors, the panels being located mainly in the ceilings, although they are also placed in walls of corridors and staircases, floors of entrance halls and covings of important rooms. The system is designed to maintain a temperature of 65° F. within the building when below freezing point outside. The total amount of panel surface is 70,000 sq. ft., involving, with mains, about 40 miles of steel pipe. The ring mains in the basement are covered with sectional cork, the reasons for this being the comparatively low temperature at which the mains will operate, and the fact that the heating mains will be used in summer to circulate cold water for cooling the building. The main circulating pumps on the heating system are connected in the flow main. This is contrary to general practice, but does not require the vent pipes to be taken so high.

Local valves for controlling the panels are set so that they cannot be opened by more than a predetermined amount. On the back block the rising mains pass through the roof and are connected to the horizontal main terminating in an air-release device.

Plenum heating is provided in some portions of the basement, including the gymnasium, badminton and squash racket courts, strong rooms, stationery store and garage. Fresh air is drawn from the courts, passed through a Ventex viscous filter, tempered by tubular heaters and discharged into the distributing duct work. Fans on the plenum system are capable of delivering 1,000,000 cu. ft. of air per hr.

How Panel Heating Coils Are Laid Under Floors of Imperial Chemical House

Arrangement of Panel Heating Coils in Arched Ceiling of Imperial Chemical House

Applying Plaster Base Over Panel Heating Coils

Interior of Butler Field House

Recirculation as Applied to the Butler University Field House

by **JOHN M. ROBERTSON**

E. K. Campbell Heating Co., Kansas City, Mo.

Part II

ON February 1, 1929, after several preliminary tests had been made to check methods and instruments, a test of 12 hrs. duration was conducted to determine the performance of this system in regard to temperature distribution, quickness in heating the cold building, and efficiency. Extreme accuracy was not attempted, partly because of the limited facilities at hand, but largely because any greater accuracy than can be obtained with reasonable care and good commercial instruments was not considered of any practical value. All instruments were calibrated and reasonable precautions were taken throughout the test.

Forty-three room thermometers were distributed over the main field house room at various points and elevations as indicated in Fig. 7. The point of each arrow designates the location of a thermometer, while the elevation above the floor of the room is given in figures. A recording thermometer was placed 83 ft. above the main floor level at the point indicated. Two thermometers were sealed to steel roof trusses, insulated from the air with 4 in. of felt and asbestos cement, to indicate the temperature of the materials inside the building and to determine the time required to heat them.

Fires were kindled at 7:30 A.M., fans started at 8:00 A.M. and a record was made of the temperature indicated by each thermometer at intervals of 1 hr. until 8:00 P.M. when the test was concluded. The field house had not been heated for six days previous to the test.

The time to heat the building from a temperature of 33° to the required temperature easily is calculated from the hourly readings of the room thermometers.

When the mass of steel and concrete that must be heated up with the air inside a building of this size is calculated, together with the amount of heat necessary to raise its temperature, the results are surprising. Table 4 lists the weights of steel, concrete, and masonry comprising the roof and balcony trusses, balcony floors and other materials suspended in the air. Such materials are of comparatively thin members with a maximum of surface exposed to the air, and the temperatures indicated by thermometers sealed to the steel trusses show that the temperature of the steel was raised about 3° slower than the temperature of the air while the room was being heated. When the fires were checked and the air allowed to cool, the temperature of the steel dropped about 3° slower than that of the air.

For comparison with the heat absorbed by materials inside the building, the total calculated heat loss from the building during the

12-hr. test is included. It is interesting to note that two-thirds as much heat is required to heat up the materials as to supply the heat loss from the building for 12 hrs.

A study of the temperature distribution and time data presented demonstrates the high efficiency of the recirculating method of distribution. Further data were obtained to determine the efficiency of the method that is employed at the Butler Field House to generate the heat and supply it to the air.

The input of available heat units to the heaters was measured by weighing the coal fired, then reducing these figures to the equivalent in dry coal by the standard method.

Output was obtained by measuring the volume of air passed over the heaters during the 12-hr. test, and measuring the rise in temperature of this air from the cold air openings to the warm-air openings.

The volume of air circulated was measured with an anemometer, carefully calibrated before and after the readings were taken. All openings were divided into small squares and an average taken of three readings in each square. Readings were taken in ducts some distance from grilles or registers, and the volume calculated by multiplying the area of the duct by the average of all average velocities in the squares.

Table 1. Chart of Time Required to Heat the Field House

Outside Temperature U.S.W. Bureau.	Condition of sky.	Movement of Wind U.S.W. Bureau.	Average Inside Temperature.	Temperature of Steel Roof Trusses.	Central Standard Time.
−4° F.	Cloudy.	8 mi/hr. N.	39°F.	34° F.	8:00 AM.
− 1°.	Cloudy.	9 mi/hr. N.	43°	36°	9:00 A.M.
+ 2°.	P. Cloudy.	6 mi/hr. N.	49°	44°	10:00 AM.
+ 4°.	Clear	9 mi/hr. NW.	55°	52°	11:00 AM.
+ 5°.	Clear	10 mi/hr. NW.	60°	55°	12:00 M.
+ 8°.	Cloudy	9 mi/hr. NW.	63°	62°	1:00 PM.
+ 9°.	Cloudy	8 mi/hr. NW.	68°	66°	2:00 PM.
+ 11°.	Cloudy	8 mi/hr. NW.	70°	68°	4:00 PM.
+ 8°.	Cloudy	7 mi/hr. NW.	67°	68°	8:00 PM.

Note- Fires were lighted 7:30 A.M. - Fans were started 8:00 A.M. - Furnaces were fired at capacity 8:00 A.M. to 4:00 P.M. then checked. - Building had not been heated for 7 days.

Table 2. Summary of Temperature Distribution 8:00 P. M.

Highest temperature (at ceiling)	72°.
Lowest temperature (at floor)	60°.
Average temperature of 41 thermometers	67°.
Temperature variation over room at level 6 inches above floor	1°.
Temperature variation over room at level 5 feet above floor	3°.
Temperature variation over room at level 15 feet above floor	3°.
Temperature variation over room at level 25 feet above floor	3°.
Temperature variation over room at level 40 feet above floor	2°.
Temperature variation over room at level 54 feet above floor	0°.
Temperature difference 6 in. above floor & 5 ft. above floor	2°.
Temperature difference 6 in. above floor & 15 ft. above floor	7°.
Temperature difference 6 in. above floor & 25 ft above floor	7°.
Temperature difference 6 in. above floor & 30 ft above floor	7°.
Temperature difference 6 in above floor & 40 ft. above floor	9°.
Temperature difference 6 in above floor & 54 ft. above floor	10°.
Temperature difference 6 in above floor & 83 ft. above floor	12°.
Average temperature difference per 7 feet elevation	1°.

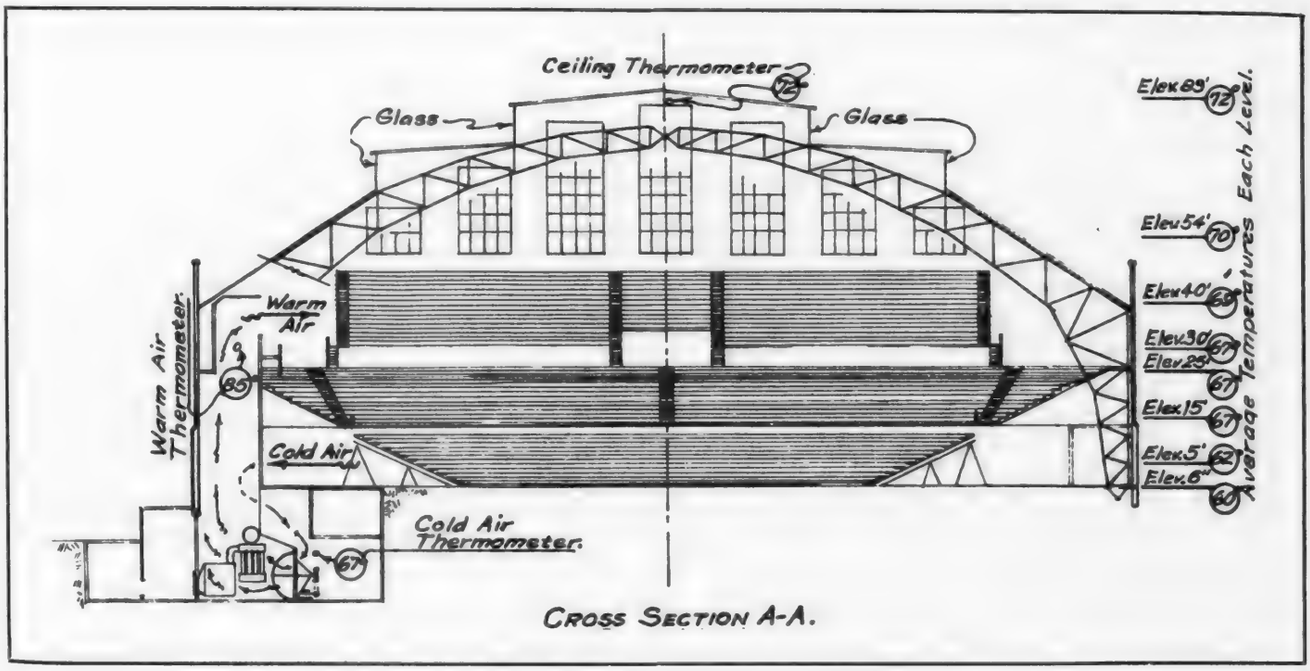


Fig. 6. Cross Section Showing Temperatures at Different Levels

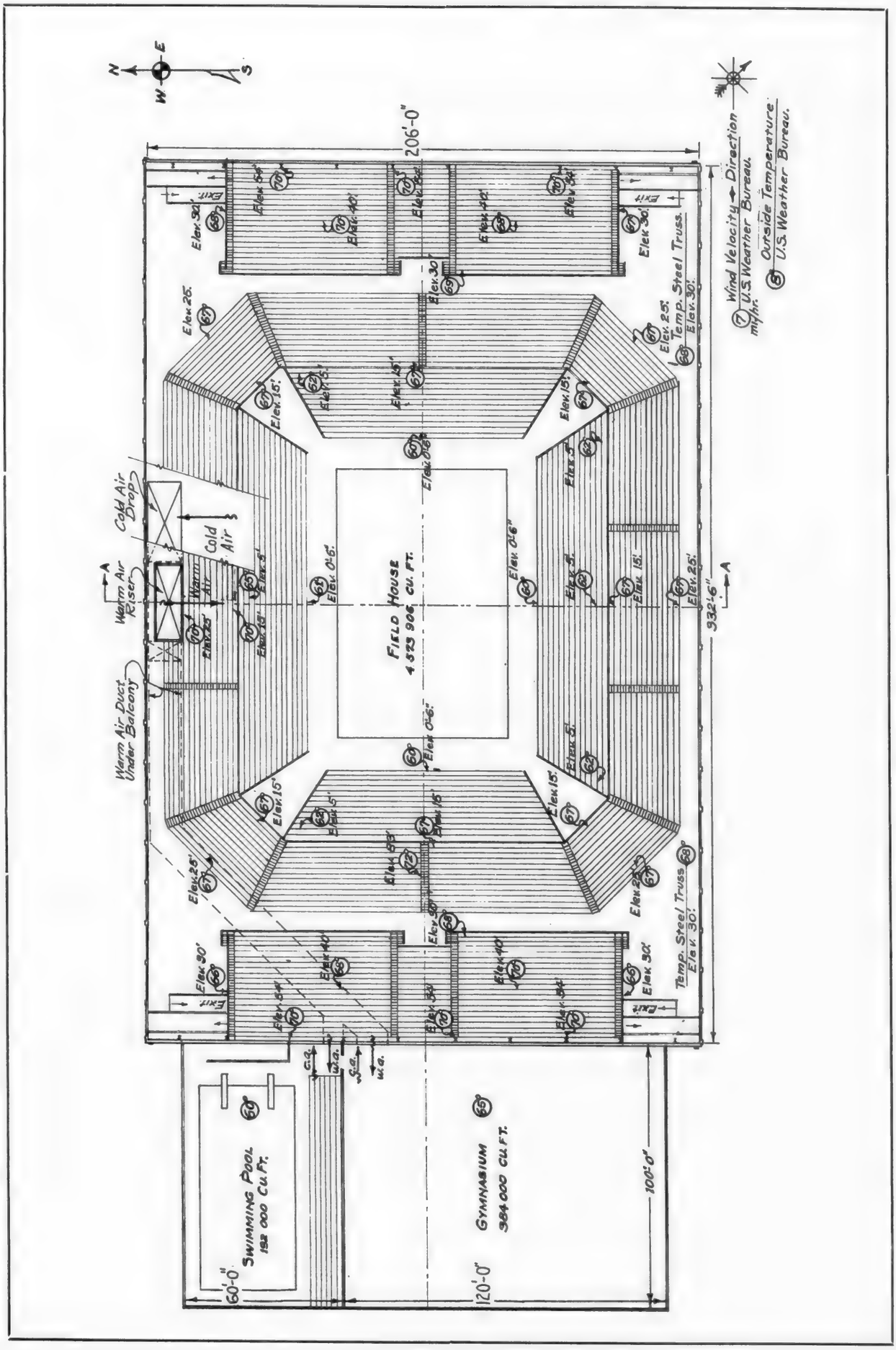


Fig. 7. Balcony Plan with Test Temperatures Indicated

Temperature rise of the air passed over the heaters was determined by placing a recording thermometer in the fan room immediately behind the fans and a similar instrument, both calibrated, at the junction of the warm-air outlet ducts. Careful preliminary tests were made with ten room thermometers in each opening to determine the point at which the average temperature of the air at each opening prevailed. It was found, however, that there was not over 3° variation at any point in the cross section of either opening, largely because of the volume and velocity of the air and the extreme turbulence of twisting motion imparted to the air by the type of fans used. Care was taken to shield the thermometers from radiant heat from the furnaces.

Table. 3. Performance Data of Heating System

OVERALL EFFICIENCY OF HEATERS.

Input = 9,000 lbs. "Loredo" W.Va. coal. Htg. value per pound dry 14250 B.T.U.
Net Input = (9,000 − 180 lbs. water) × 14,250 B.T.U. — 125,685,000 B.T.U.
Output = 341,770 cu. ft. air × 720 min. × .01777 B.T.U. × 26° — 113,691,294 B.T.U.
.01777 is B.T.U. to raise 1 cu. ft. dry air at 29.61" pressure 1°F at average temperature of 75°F. or Wt. at 75° × C_p × 29.61 ÷ 29.921.
Heat Furnished by boiler & economizer = 108,864 B.T.U. × 12 hrs 1,306,368 B.T.U.
Net output of Furnaces — 112,384,926 B.T.U.
Overall Efficiency of Furnaces = Input ÷ Output = 89.4 %.

ANALYSIS OF DATA.

Total heat supplied to building for 60° rise for 12 Hours 113,691,294 B.T.U.
Estimated heat requirement for same period — 112,003,721 B.T.U.
Heat loss unaccounted for — 1,687,573 B.T.U.
Error in estimating heat loss in ratio to heat actually supplied 1.4 %.
Heat supplied by each furnace per hour — 3,121,803 B.T.U.
Coal burned per furnace per hour — 245 lbs.
Coal burned per Sq. Ft. grate area per hour — 12.5 lbs.

Table 4. Detailed Heat Loss Calculations

HEAT LOSS PER HOUR.

Glass above 50' level - 8090* × 1.1 B.T.U. × 70°	692,230 B.T.U.
Glass below 50' level - 6943* × 1.1 × 60°	458,238 B.T.U.
8" Brick wall above 50' level - 6342* × .42 × 70°	186,455 B.T.U.
12" Brick wall below 50' level - 14,166* × .32 × 60°	271,987 B.T.U.
16" Brick wall below 50' level - 20,102* × .26 × 60°	313,591 B.T.U.
20" Brick wall below 50' level - 3256* × .23 × 60°	44,939 B.T.U.
Roof - 1" Fibrofelt - 5 Ply Asbestos - 77,992* × .27 B.T.U. × 70°	1,474,048 B.T.U.
4" Cement floor - 28,258* × .38 B.T.U. × 15°	131,391 B.T.U.
Moist earth floor - 33,400* × .35 × 15°	175,560 B.T.U.
Wood floor with sleeper on earth - 6400* × .13 × 15°	12,480 B.T.U.
Leakage - 4,573,906 cu ft × .9896* × .019 B.T.U. × 60° × 1/4 change/hr.	1,290,006 B.T.U.
Total heat loss for Field House Main Room	5,050,919 B.T.U.
Glass in Gym. - 792* × 1.1 B.T.U. × 60°	52,272 B.T.U.
12" Brick in Gym. - 5368* × .32 × 60°	103,065 B.T.U.
Roof on Gym. - 12,000* × .27 × 65°	210,600 B.T.U.
Floor in Gym. - 12,000* wood on earth × .13 B.T.U. × 15°	23,400 B.T.U.
Leakage - Gym. - 384,000 cu. ft. × .9896* × .019 B.T.U. × 60° × 1/4	108,301 B.T.U.
Total Heat Loss for Gymnasium	497,639 B.T.U.
Glass in Pool - 1056* × 1.1 B.T.U. × 60°	69,696 B.T.U.
12" Brick wall in pool - 3474* × .32 B.T.U. × 60°	66,701 B.T.U.
Roof on Pool - 6000* × .27 × 65°	105,300 B.T.U.
Leakage - 192 000 cu ft × .9896* × .019 B.T.U. × 60° × 1/4 change	54,150 B.T.U.
Total Heat Loss for Swimming Pool	295,847 B.T.U.
Total Heat Loss for Building per Hour	5,844,405 B.T.U.

HEAT ABSORBED BY MATERIALS IN BUILDING.

Steel Roof deck above 50' level - 300,000 lbs. × .11 B.T.U. × 40°	1,320,000 B.T.U.
Steel Roof trusses above 50' level - 1,200,000 lbs. × .11 × 40°	5,280,000 B.T.U.
Steel roof trusses below 50' level - 464,000 lbs. × .11 × 30°	1,531,200 B.T.U.
Steel balcony trusses - 972,000 lbs. × .11 × 30°	3,207,600 B.T.U.
Gaurd rails & misc. steel - 60,000 lbs. × .11 × 30°	198,000 B.T.U.
Concrete in balconies & ramps - 4,484,660 lbs. × .21 B.T.U. × 30°	28,253,000 B.T.U.
Inside tile partitions - 620,000 lbs. × .195 B.T.U. × 30°	3,627,000 B.T.U.
Air in building - 5,149,906 cu ft × .9896* × .019 B.T.U. × 30°	2,904,880 B.T.U.
Ice melted & evaporated (.000917 lbs. × 38% r.h. − .000441 lbs. × 48% r.h.) × 5,149,906 × .9896* × (144 B.T.U. + 338 B.T.U. + 971.7)	809,144 B.T.U.
Total heat absorbed by materials in building	47,130,824 B.T.U.

HEAT REQUIRED FOR 12 HOURS - 0° OUTSIDE - 33° TO 63° INSIDE.

Heat loss first hour - 5,844,405 × 2	2,922,202 B.T.U.
Heat loss second hour - 5,844,405 × .7	4,091,085 B.T.U.
Heat loss third hour - 5,844,405 × .9	5,259,965 B.T.U.
Heat loss third to twelvth hours - 5,844,405 × 9	52,699,645 B.T.U.
Heat to raise temperature of materials inside 30°	47,130,824 B.T.U.
Total heat required for 12 hours	112,003,721 B.T.U.
Average heat required per hour	9,383,560 B.T.U.

*.9896 is correction factor for barometric pressure during test 2/1/29.

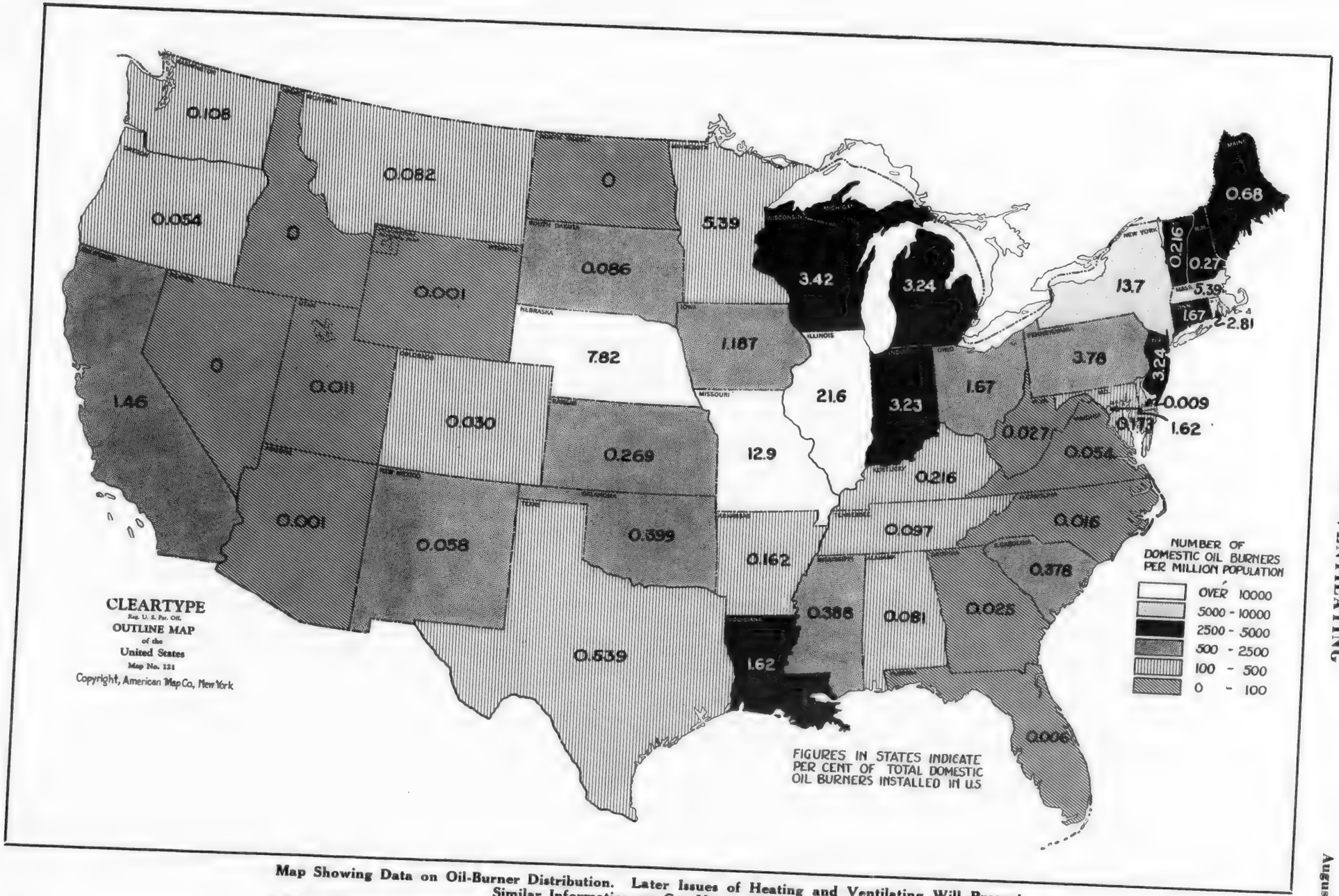
The chart of warm-air temperatures has been cut away at the heavy black line and pasted over the chart of cold-air temperatures so that the time coincides. Since the warm-air chart is for high temperatures and at a different temperature scale, the line of warm-air temperatures is inside the line of cold-air temperatures.

By taking temperature readings at 5-min. intervals through the 12-hr. test from these two charts, and averaging the difference between the cold air and the warm air from all readings, an average temperature rise of 26° F. was determined.

Together with the data obtained from the recording thermometers, the above data made possible the calculation of the overall efficiency of the heaters.

Proposed Specifications for Pipe Fittings

In a notice dated June 7, 1929, the Federal Specifications Board announces that it has prepared a draft of proposed purchase specifications for pipe fittings, 125 lbs. brass or bronze (threaded) bought by the various departments and establishments of the United States Government. A copy of the proposed specifications may be obtained by writing the board, care of Bureau of Standards, Washington, D. C. Comments and suggestions from interested parties are requested.



Map Showing Data on Oil-Burner Distribution. Later Issues of Heating and Ventilating Will Present Similar Information on Gas House-Heating.

Editor's Note: Due to error Minnesota is classified between 100 and 500. It should have been between 5000 and 10,000.

Oil-Burner Distribution Data Show Startling Sales Possibilities

ON the opposite page is presented a map prepared by HEATING AND VENTILATING, showing the distribution of domestic oil burners by states together with data showing the relation between the number of burners and the population. The map is based on data prepared by the American Oil Burner Association, showing the distribution of burners as determined from fuel oil consumption.

From tables showing the distribution of burners for the years 1926 and 1927, additional estimates were made by the association for the year 1928. These data, shown in the second column of the accompanying table, are of considerable interest, but the figures are more or less meaningless unless coupled with population. The third column of the table shows the relation between distribution and population, while the map shows such data divided into five arbitrary classifications. The number of burners in each state was based on the survey made by the Oil Heating Institute which showed that on January 1, 1929, the number of burners installed was 422,700.

An analysis of the table shows that although Nebraska has only 7.82% of the total number of domestic burners in the country, it ranks first in the number of burners per capita, distribution being in the order of 23,480 burners per million inhabitants. Although Arizona and New Mexico are, in general, closely related so far as climate and fuel conditions are concerned, the table shows that the former has only 9.2 burners per million population, while New Mexico has 625. Apparently, Arizona would furnish a profitable field for oil-burner sales.

Pennsylvania rates only 1648 against 5070 burners per million for New York. This is a case where a local condition affects the distribution, as the low cost of anthracite undoubtedly retards oil-burner sales.

Rhode Island seemingly has afforded a rich field for the oil burner. Although the state has only 0.594% of the country's population, it has 2.81% of the oil burners. This is shown up in a striking manner in the comparison of the three states, Massachusetts, Connecticut and Rhode Island. These states have, respectively, 5390, 4300 and 16,800 burners per million population.

Many other interesting comparisons can be made. For example, although the same climatological conditions prevail in the two states, Delaware has only 157 oil burners per million population, while Maryland has 459. In the same section, the District of Columbia has 12,700 burners per million, due, undoubtedly, to the population being completely urban and also to the high per capita wealth of the city of Washington.

It is striking that the four states, Illinois, New York, Missouri and Nebraska, contain 56% of the total number of oil burners, so that other states should offer a wide field for the promotion of sales of domestic oil burners.

While the oil burner attained its first popularity in California, and while that state contains large and productive oil wells. there is only 1.46% of the nation's total burners installed in homes in that state.

In the succeeding issues, HEATING AND VENTILATING will present further data on this interesting subject, and show the distribution of oil burners as compared with the per-capita wealth, distribution of pleasure cars, number of wired homes, and distribution of electrical appliances.

	Per cent Population	Per cent Domestic Oil Burners	Oil Burners per Million
Alabama	2.155	0.081	134.3
Arizona	0.387	0.001	9.2
Arkansas	1.622	0.162	357.0
California	3.740	1.46	1395.0
Colorado	0.911	0.030	117.5
Connecticut	1.380	1.67	4300.0
Delaware	0.205	0.009	156.8
District of Columbia	0.456	1.62	12700.0
Florida	1.150	0.006	18.6
Georgia	2.673	0.025	33.4
Idaho	0.451	0.0	0.0
Illinois	6.150	21.6	12590.0
Indiana	2.658	3.23	4350.0
Iowa	2.045	1.187	2075.0
Kansas	1.120	0.269	859.0
Kentucky	2.140	0.216	361.0
Louisiana	1.632	1.62	3540.0
Maine	0.668	0.68	3640.0
Maryland	1.348	0.173	459.0
Massachusetts	3.580	5.39	5390.0
Michigan	3.785	3.42	3230.0
Minnesota	2.265	5 39	8475.0
Mississippi	1.513	0.388	915.0
Missouri	2.960	12.9	15600.0
Montana	0.603	0.082	485.0
Nebraska	1.178	7.82	23480.0
Nevada	0.065	0.0	0.0
New Hampshire	0.384	0.27	2515.0
New Jersey	3.162	3.24	3660.0
New Mexico	0.331	0.058	625.0
New York	9.650	13.7	5070.0
North Carolina	2.460	0.016	23.5
North Dakota	0.541	0.0	0.0
Ohio	5.660	1.67	1053.0
Oklahoma	2.020	0.399	705.0
Oregon	0.750	0.054	256.0
Pennsylvania	8.200	3.78	1648.0
Rhode Island	0.594	2.81	16850.0
South Carolina	1.558	0.378	869.0
South Dakota	0.587	0.086	524.0
Tennessee	2.100	0.097	165.5
Texas	4.550	0.539	423.0
Utah	0.441	0.011	89.2
Vermont	0.297	0.216	2600.0
Virginia	2.150	0.054	89.9
Washington	1.319	0.108	293.0
West Virginia	1.430	0.027	67.5
Wisconsin	2.460	3.24	4700.00
Wyoming	0.204	0.001	17.5

A.S.H.V.E. Adopts Boiler Manufacturers' Testing Code

AN important step toward clearing up the confused situation in the testing and rating of boilers was taken by the American Society of Heating and Ventilating Engineers at its summer meeting at Bigwin Inn, Lake of Bays, Ontario, Can., June 26-28.

The testing code of the National Boiler and Radiator Manufacturers' Association, known as the "Steam Heating Boiler Testing Code" of that organization, was adopted verbatim by the society and renamed the "A.S.H.V.E. Performance Test Code for Steam Heating Solid Fuel Boilers."

This code supersedes the society's code for conducting laboratory tests of low-pressure steam heating solid fuel boilers. However, the A.S.H.V.E. Testing Code, as adopted in 1924, will still be used for making field tests. For this purpose it was slightly revised as of June, 1929.

The testing code of the National Boiler and Radiator Manufacturers' Association, which has just been adopted by the society, outlines laboratory tests to determine the efficiencies and performance of heating boilers and gives the forms used in reporting such tests. The code follows:

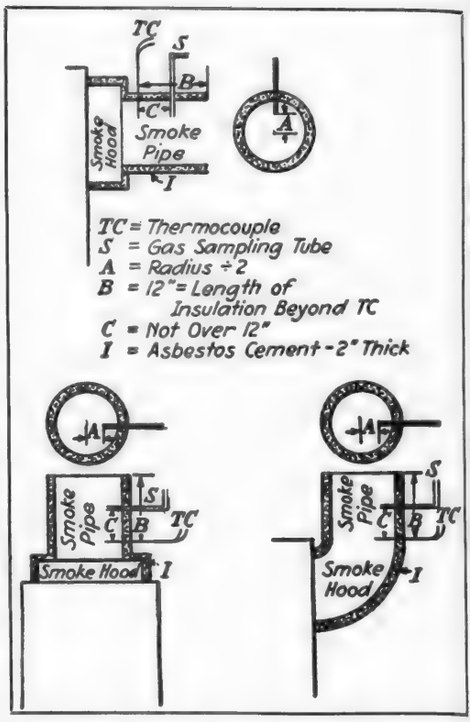
A. S. H. V. E. Performance Test Code for Steam Heating Solid Fuel Boilers

1. The object of this code is to specify the tests to be conducted and to provide a standard method for conducting and reporting tests to determine the efficiencies and performance of the boiler.

2. Chimneys.—Tests may be conducted with either natural draft or induced draft. The boiler shall preferably be attached to a chimney of dimensions nearest to those cataloged by the manufacturer. If a proper sized chimney is not available and therefore induced draft or a larger chimney is used, means must be provided for reducing the draft so that the draft at no time exceeds that which would have been obtained with chimney as specified by the manufacturer.

3. Boiler Set-Up.—The boiler tested shall be a standard stock boiler. It shall be assembled in accordance with the manufacturer's directions, care being taken that all openings which normally would be closed (when manufacturer's directions are followed) in practice are closed with the proper type of cement or putty.

4. If the boiler is provided with an insulated jacket, this jacket shall be in place during tests. If boiler is uninsulated, all parts which normally would be covered in practice shall be covered with a coating of asbestos cement 1½ in. thick or equivalent insulation, or the boiler may be tested without covering and correction applied as explained in Par. 40 (Item *n*) under Computations. Parts of boiler which are not insulated in practice shall not be insulated during tests and shall not be considered as external boiler surface.



Location of Gas Temperature Thermocouple and Gas Sampling Tube A.S.H.V.E. Performance Test Code

Arrangement of Apparatus

5. The general arrangement of apparatus shall be as shown in Fig. 1. Minimum apparatus for conducting tests shall be the following:

(*A*)—Scales for weighing coal and residue

(*B*)—Calibrated weighing tank or other means for determining water evaporated

(*C*)—Thermometers for determining feed water and steam temperature

(*D*)—Mercury manometer for determining steam pressure

(*E*)—Draft gauges for determining ash pit, fire box, and smoke outlet draft

(*F*)—Pyrometer for determining temperature of gases leaving boiler

(*G*)—Recording or indicating CO_2 and CO apparatus and means for checking recording apparatus

(*H*)—Scale for weighing condensation obtained from separator

(*I*)—Barometer or barograph for determining atmospheric pressure during test.

6. Location of Instruments.—The feed water thermometer shall be inserted in a thermometer well so located as to

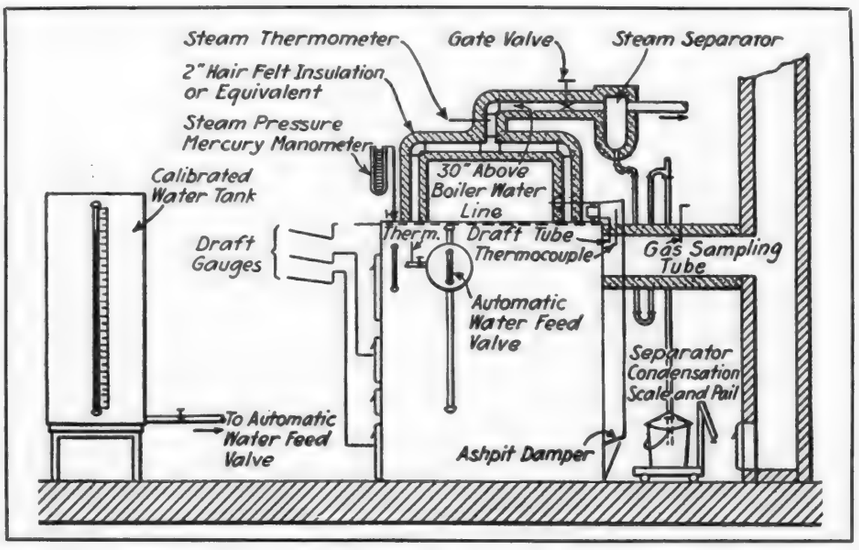


Fig. 1. Arrangement of Boiler Test Apparatus Specified in New Code

read the true temperature of the water entering the boiler. The steam temperature thermometer shall be inserted directly into the steam in the flow outlet.

7. The mercury manometer shall be connected with the steam space of the boiler.

8. A draft gauge shall be connected to an open end tube set at right angles to the flow of gas in each of the following: ash pit, fire box, and smoke outlet collar. To prevent influence upon gas samples, draft reading, or gas temperature reading, choke dampers between flues and smoke outlet collar shall be left in wide open position throughout all tests. Cold air checks between smoke outlet collar and flues shall be thoroughly sealed during tests. Air leakage around draft tubes, thermocouples and gas sampling tubes shall be prevented by using asbestos rope or other suitable means packed around the tubes.

9. The temperature of gases leaving the boiler shall be taken by means of an exposed thermocouple located as shown on Fig. 2. The smoke hood and smoke pipe shall be covered with 2 in. of asbestos cement to a distance 1 ft. beyond the thermocouple.

10. The gas sampling tube shall be a single open-end tube in position corresponding to gas temperature thermocouple and shall be placed in the smoke pipe within 1 ft. of the gas temperature thermocouple as shown on Fig. 2.

11. Accuracy of Instruments.—All instruments shall be calibrated to insure accuracy.

12. Fuels to be Used.—For anthracite boilers the fuel used shall be the commercial size, best suited to the boiler, as specified by the manufacturer. For soft coal boilers the coal used shall be a free burning 3 x 2 in. lump coal unless the boiler performs more satisfactorily with caking coal. If caking coal is used it shall be of approximately 3 x 2 in. lump size. For coke boilers the coke used shall be by-product or gas coke of commercial size, best suited to the boiler.

13. If the boiler is designed for a special solid fuel, tests shall be conducted with this fuel. In all cases the characteristics, kind, and size of fuel used in making tests shall be recorded on the test form. Sizes of fuel used shall be according to classification of American Society of Mechanical Engineers, as given in Table 1.

Test To Be Conducted

14. Five tests shall be conducted at 2 lb. steam gauge pressure—one shall be at drive output and the other four at various output rates to show the entire operating range of the boiler. The manufacturer shall determine and designate the output rates and the operating range of the boiler. No test data or boiler information shall be assumed for an output beyond the drive test. The drive test shall be considered the boiler's maximum output. No tests shall be reported in which the water collected from the separator is greater than 2% of the water fed to the boiler in excess of the condensation resulting from the normal heat loss of the separator and piping. Correction for the water collected must be applied to the water evaporated in order to include in the output only the heat actually absorbed to heat the water from feed water temperature to steam temperature.

15. Outlet Piping.—The number and size of outlets shall be as cataloged by the manufacturer. Outlets shall be full size to a height 30 in. above the boiler's normal water line. An effective separator shall be placed in the steam outlet as near the boiler as practicable. The separator shall be open to the atmosphere through a water seal permitting any water separated from the steam to drain immediately into a container for weighing. Re-evaporation of water drained from separator shall be prevented by use of a suitable cover on the container.

16. A gate valve, full size of flow piping, shall be placed between boiler and separator for the purpose of maintaining a constant steam pressure in the boiler at various test output rates. All piping up to and including separator shall be insulated with 2 in. of hair felt, or equivalent.

TABLE 1. NAMES AND SIZES OF VARIOUS FUELS

Domestic Hard Coals

Name and Size	Screen Through, In.	Screen Over, In.
Pea	¾	½
Chestnut or Nut	1¼	¾
Stove or Range	1¾	1¼
Egg—in the East	2½	1¾
Large Egg—Chicago	4	2¾
Small Egg—Chicago	2¾	2
Broken or Grate	4	2½

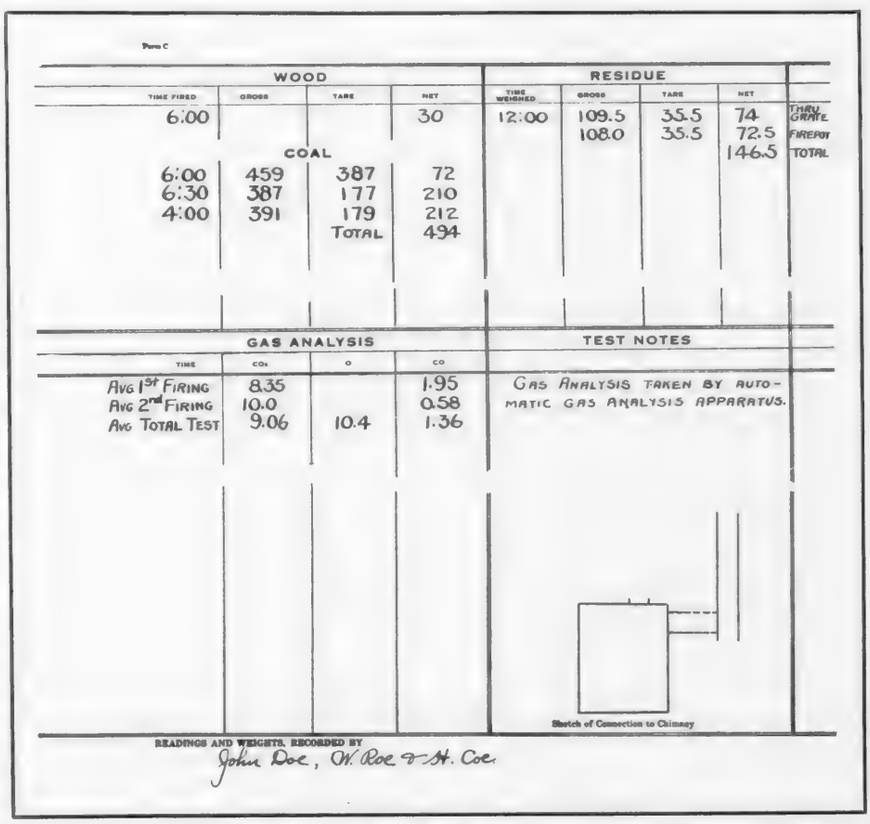
Domestic By-Product Coke

Egg	3	2½
Large Stove	2½	2
Small Stove	2	1½
Nut	1½	¾
Pea	¾	½

Bituminous Coal

Duff	⅛	
No. 3 Nut	1¼	¾
No. 2 Nut	2	1¼
No. 1 Domestic Nut	3	1½ or 2
No. 4 Washed	¾	¼
No. 3 Washed Chestnut	1¼	¾
No. 2 Washed Stove	2	1¼
No. 1 Washed Egg	3	2
No. 3 Roller Screened Nut	1½	1
No. 2 Roller Screened Nut	2	1½
No. 1 Roller Screened Nut	3½	2
Egg	6	3
Lump or Block		6

Run-of-Mine: fine and large lumps.
Screenings: usually smallest sizes.
Pocahontas Smokeless: Generally sized as: Nut, Egg, Lump, and Mine Run.
Cannel Coal:
For fireplaces—Hand Picked Lump.
For stoves—Egg.



Fuel and Flue Gas Data Form

HEATING BOILER TEST REPORT—SOLID FUEL BURNING

Boiler	ROUND BOILER	Connection to Chimney—Length	3 FT.	Fuel Capacity (Catalog) Lbs.	282	B. T. U.	12812	13248		
Rating Sq. Ft.	875	" " " —No. of Bends	ONE	Fuel Available " Lbs.	212	Moisture	2.95	3.80		
Grate Area Sq. Ft.	2.62	" " " —Size	9 IN.	Fuel Depth " Ins.	23¾	Volatile Matter	4.46	3.45		
Heating Surface Sq. Ft.	34.32					Fixed Carbon	81.30	84.59		
						Ash	14.24	11.96		
						Sulphur	0.94	1.08		

	Date of Test			8-11-25	10-9-24	10-8-24	8-7-25	8-18-25			
	Serial Number			9057	7964	7963	9054	9065			
	Test Number			4	2	1	3	5			
1	OUTPUT	Sq. Ft. Radiation	Sq. Ft.	284	495	597	798	1039			
2		Percent of Rating	%	32.4	56.6	68.3	91.2	119			
3	EFFICIENCY	Boiler	%	69.7	72.0	69.8	66.8	61.6			
4		Boiler and Grate	%	66.5	70.3	67.1	61.7	56.4			
5		Evaporative Power*	Lbs.	8.99	9.28	9.00	8.61	7.93			
6	STACK GAS TEMPERATURE		F°	353	420	482	610	754			
7		Outside Air Temperature	F°	75	70	67	72	71			
8	LOSSES	Grate	%	4.6	2.3	3.8	7.5	8.4			
9		In Dry Gases Leaving Boiler	%	12.1	11.2	14.8	19.1	23.9			
10		Incomplete Combustion	%	5.3	3.9	3.7	8.6	12.1			
11		Radiation from Covered Boiler	%	3.9	2.3	1.9	1.3	0.9			
12	FUEL	Kind		ANTH.	ANTH	ANTH.	ANTH.	ANTH.			
13		Size		STOVE	STOVE	STOVE	STOVE	STOVE			
14		Calorific Value	B. T. U.	12812	13248	13248	12812	12812			
15		Burned per hour	Lbs.	7.60	12.44	15.5	22.35	31.5			
16		Burned per sq. ft. grate per hour	Lbs.	2.90	4.75	5.91	8.52	12.0			
17		Average Interval Between Firings*	Hrs.	25.9	15.7	12.4	8.5	6.0			
18		Average Interval Between Attention	Hrs.	28.0	16.3	13.8	9.0	6.1			
19		Clinker	%								
20	GAS ANALYSIS	CO_2	%	8.0	11.0	10.2	9.1	10.7			
21		O	%	12.1	8.9	10.0	10.4	9.9			
22		CO	%	0.7	0.7	0.6	1.3	0.2			
23	DRAFT	Natural or Induced		NAT.	NAT.	NAT.	NAT.	NAT.			
24	DRAFT	In Smoke Outlet	Inches H_2O	0.054	0.122	0.137	0.181	0.176			
25		Over Fire	" "	0.048	0.113	0.120	0.130	0.107			
26		In Ash Pit	" "	0.039	0.086	0.081	0.050	0.000			
27	CRIMNEY	Size	Inches	8X12	8X12	8X12	8X12	8X12			
28		Height	Ft.	40	40	40	40	40			
29	Duration of Test		Hrs.	56	33½	27½	18	12¼			

*Based on coal of 13000 B. t. u. per pound

BOILER MFR. BOILER CO.

Standard Form for Summary of Data, A.S.H.V.E. Performance Test Code for Steam Heating Solid Fuel Boilers

17. Outlet piping shall pitch away from the risers and away from the separator.

18. For all boilers up to 3000 sq. ft. of steam radiation, water shall be supplied by an automatic feed valve of the slow feed type, which will maintain a constant water level at the normal water line. For boilers above 3000 sq. ft. output, feed water may be regulated by hand by means of a gate valve.

19. Chimney Connection.—Connection from smoke hood outlet to chimney shall be of size cataloged by manufacturer and shall be air tight and as short and direct as possible, preference being given to long radius and 45° instead of 90° bends. The bend at entrance to chimney shall carefully be made, care being taken that the pipe does not project beyond inside of chimney and that no leakage of air occurs.

20. Cleaning Boilers.—The water and steam surfaces of the boiler shall thoroughly be cleaned by vigorous boiling with a solution of sal-soda or lye, the scum forming at the surface of the water being blown out through a surface blow out, or the boiler outlets, with fresh water gradually fed to the boiler, until the water in the gauge glass appears clean. The boiler then shall be drained and refilled with clean water.

21. Duration of Test.—Each test shall be conducted at the discretion of the engineer until there has been burned in pounds per square foot of grate not less than 250 in the continuous fire method or 150 in the new fire method, or until the error in fuel and water determination shall not exceed 2%.

22. Calorific Tests and Analysis of Fuels and Refuse.—The quality of the fuel and of the ash and refuse shall be determined by calorific tests and analysis of samples. Directions for obtaining samples of the fuel and making these tests and analyses shall be the recommendations in the A.S.M.E. Test Code for Solid Fuels—April, 1927.

23. A representative sample of the fuel shall be taken during the test and shall be kept in an air tight container pending determination of moisture.

Starting and Stopping of Test

24. New Fire Method.—New fire method of starting and stopping test may be used on anthracite or coke boilers. A preliminary fire using wood or coal shall be made and the boiler shall be operated until the water in the boiler has reached steam temperature and the boiler insulation normal operating temperature. During this preliminary operation the water in the gauge glass shall be kept at the normal boiler water line. The fire then shall quickly be removed from the boiler, the ash pit cleaned, the flues thoroughly cleaned, the quantity of water in tank noted, and the test started by placing a charge of kindling wood on the grate (9 lb. for each square foot of grate) igniting same and firing 33⅓% of the Fuel Charge (Available Fuel). A second amount of fuel equal to the Fuel Charge (Available Fuel) shall be fired within the first half hour of test. No firing or attention to fuel shall be permitted after this first half-hour period until the time of adding the next fuel charge.

25. When test has been conducted for such a period as specified under Duration of Tests (par. 21), and the fuel has burned down to that point where the output can no longer be maintained by operation of the dampers, the test shall be ended as follows:

(*A*)—The grates shall be shaken to remove ash from the fire as if another charge of fuel were to be added.

(*B*)—The cleanings shall quickly be removed from the ash pit and weighed.

(*C*)—The residue with the fire box shall quickly be quenched with just sufficient water to put out the fire. (The quantity of water used shall be recorded.)

(*D*)—The entire residue of the fire box shall be removed and weighed, and shall be kept separate from the cleanings. The water level at the end of the test shall be the same as at the beginning of test.

26. Continuous Fire Method.—The continuous fire method may be used for all boiler tests. The boiler shall be oper-

ated under test conditions for at least one firing period and not less than 1 hr. before the starting of test. A preliminary fire shall be made and the boiler operated until the water has reached steam temperature, and the boiler insulation normal operating temperature. The flues then shall be cleaned thoroughly. The fire then shall be burned low, thoroughly cleaned, and the remaining live fuel spread evenly over the grate as the foundation for the first test fuel charge. If the manufacturer provides firing directions these directions shall be followed.

27. The thickness of the fuel bed shall quickly be measured and the condition of the fuel bed noted. The height of water in boiler and feed tank shall be recorded. Tests shall start at the time of making these observations. The first weighed charge of fuel (see par. 29) shall then be fired. If firing directions are specified by manufacturer, same shall be followed. The ash pit shall be thoroughly cleaned immediately and the test allowed to proceed.

28. At the end of the test fire shall be burned low and cleaned so as to leave the fuel bed in the same condition and thickness as at the start of the test. When this condition is reached the water level in the boiler shall be at the same height as at the start and the test shall be ended at this time. The contents of the ash pit shall quickly be removed and weighed.

29. The Fuel Charge for all tests shall be:

(*A*)—The amount specified by the manufacturer, or

(*B*)—the amount determined by the engineer in charge of test as the maximum amount of fuel consistent with proper boiler performance.

30. The Fuel Charge (Available Fuel) used in computations to determine the Average Interval between Firings which is recorded on Form D, Item 17, shall be obtained as follows:

(*A*)—New Fire Method: Divide the total quantity of fuel fired during test (but not including the wood or coal used as a preliminary charge) by the number of firings during test.

(*B*)—Continuous Fire Method: Divide the total quantity of fuel fired during test by the number of firings during test.

31. Attention to fire shall be considered as any one or more of the following operations and in all tests burning anthracite or coke of nut or larger size there shall be no shaking of grates or other attention to fire except at time of recharging boiler:

(*A*)—Firing. (*C*)—Leveling.

(*B*)—Stoking. (*D*)—Shaking grate.

32. The average interval between the end of any attention period and the beginning of the next shall be stated in the report of test.

33. All dampers controlling the primary and secondary air may be adjusted as required to produce most efficient combustion at any time during test.

34. The following readings shall be recorded at regular intervals not greater than 15 min. throughout test:

(*A*)—Water evaporated.

(*B*)—Temperature of feed water.

(*C*)—Steam temperature.

(*D*)—Steam pressure.

(*E*)—Drafts in ash pit, fire box and smoke outlet.

(*F*)—Temperature of gases leaving boiler.

(*G*)—Weight of water from separator.

35. Following readings shall be recorded every hour:

(*A*)—Boiler room temperature.

(*B*)—Outside temperature.

(*C*)—Barometric pressure.

36. In all tests using bituminous coal, any smoke observations shall be recorded every 15 sec. according to Ringelman Chart numbers throughout two complete firing periods.

Test Forms

37. Results of tests shall be recorded on test forms as follows:

(*A*)—Boiler Room Log Sheet—Form A (for new fire method) or Form B (for continuous fire method) shall be used for recording all readings during test.

(*B*)—The Back of the Boiler Log Sheet—Form C shall be used for recording weights of fuel, residue, gas analysis (if Orsat Apparatus only is used), or for recording check

SHEET NO ——— OF ——— SHEETS Form A

BOILER ROOM LOG SHEET—NEW FIRE METHOD

BOILER — Name and Number: ROUND BOILER; Description: BASE, FIREPOT, DOUBLE SECTION, SINGLE SECTION AND DOME; Manufactured by: BOILER COMPANY; Object of Test: EFFICIENCY AND PERFORMANCE

DESIRED OUTPUT — Sq. Ft. 875; % of Rating 100; Lbs. of Water 180

Date of Test AUG 7, 1925; Serial No 9054; Test No 3

Fuel — Kind ANTH; Size STOVE

Chimney: Size 8X12; Height (ft) 40; Induced Draft NATURAL DRAFT

FUEL ANALYSIS

Proximate	%	Ultimate	%
Volatile Matter	4.46	Carbon	
Fixed Carbon	81.30	Hydrogen	
Ash	14.24	Nitrogen	
Sulphur	0.94	Oxygen	
		Sulphur	

Calorific Value 12812 B t u per lb

Steam Outlets Used: No 1 Size (ins.) 3

Location TOP FRONT

Grate Area* (sq ft) 2.62; Heating Surface (sq. ft.) 34.32; External Surface (sq. ft.) 28.2

*Fire line at Grate Level

Fuel Capacity at	23¾	ins. fuel depth
Fuel Available	75	% of above capacity)
a Wood used in starting fire		30
b Fuel equivalent of wood	(a)×0.4	12
c Fuel fired during test		494
d Total fuel as fired	(b)+(c)	506
e Moisture in fuel	% lbs.	14.9
f Total dry fuel fired	(d)−(e)	491.1
g Total residue and cleanings		146.5
h Combustible burned	(f)−(g)	344.6
i Net dry fuel burned	(h)÷(t)	402
j Dry fuel burned per hour	(i)÷hrs.	22.35
k Dry fuel burned/hour/sq ft grate	(j)÷G A	8.52
l Combustible per pound of fuel from Analysis		0.8576
Cleanings from Ashpit: Total (38.88% Comb.)		74.0
Ash (lb) Clinker (lb)		
Unburned (lb) 33.6 Slate (lb)		
Clinker from Firebox		

Hr of Test	TIME Hrs	Min	WATER (LBS) Reading on Tank Gauge	Evap between readings	Evap per hour	Total Evap from start of Test	DRAFTS (ins. H2O) In smoke Outlet	In Fire box	In Ash pit	Barom Pressure (ins Hg)	Steam Pressure Lbs per Sq In	TEMPERATURES °F Feed Water	Steam	In Smoke Outlet	Boiler Room	Outside Air
		9 00	650			450										
		15	580	30			.17	12	06		2.1	74	219	590	86	75
		30	535	45			.18	12	.02		2.2	74	219	640		
		45	480	55			.18	11	02		2.2	74	219	640		
	4	10	440	40	170	620	.18	11	.02		2.2	74	219	625		
		15	385	55			.18	11	.02		2.2	75	219	570	85	75
		30	340	45			.16	11	.04		2.3	75	219	510		
		45	300	40			.16	11	.04		2.2	75	219	525		
	5	11	260	40	180	800	.16	11	.03		2.2	75	219	520		
		15	650	605	45			.16	11	.03		2.2	75	219	520	83	71
		30	570	35			.16	12	.06		2.3	74	219	530		
		45	530	40			.17	12	.05		2.2	74	219	550		
	6	12	490	40	160	960	.17	13	.07		2.3	73	219	565		
		15	450	40			.17	14	.07		2.3	73	219	565	83	70
		30	405	45			.17	14	.07		2.3	73	219	565		
		45	365	40			.17	14	.09		2.3	73	219	570		
	7	1	320	45	165	1125	.17	14	.09		2.3	73	219	590		
	15	9	650	590	60	210	2435	22	15	05		2.2	72	219	820	
		15	530	60			.18	15	.10		2.4	72	219	600	76	71
		30	480	50			.18	15	.10		2.2	72	219	610		
		45	430	50			.18	15	.10		2.2	72	219	510		
	16	10	395	35	195	2630	.15	14	.10		2.3	72	219	510		
		15	355	40			.17	15	.10		2.3	73	219	500	78	71
		30	325	30			.16	14	.10		2.3	73	219	500		
		45	300	25			.19	16	.10		2.2	73	219	640		
	17	11	650	610	40	135	2765	.19	15	.08		2.2	73	219	640	
		15	570	40			.19	15	.06		2.2	73	219	670	78	71
		30	525	45			.21	15	.05		2.2	72	219	690		
		45	475	50			.20	15	.05		2.0	72	218	640		
	18	12	445	30	165	2930	.19	14	.05		1.7	72	217	600		
		FINAL	398	47												
		QUENCHING	378	20		2997										
Total																
Average							.181	13.0	.056		2.02	73.5	219	610	81	72

m. Actual evaporation x factor of evaporation: 2997 X 1.144

n. Corrections: Heat loss from uncovered boiler; Heat loss from uncovered piping: 28.2 X 18 X 18 X 135 X 1/970.4

FOUND 3429; 127

l. Boiler Eff. $\frac{3556 \times 970.4}{402 \times 12812} = 66.8\%$

a. B&G Eff. $\frac{3556 \times 970.4}{(402 + 35.6) \times 12812} = 61.7\%$

p. Total Equivalent Evaporation (m)+(n)+(o): 3556

q. Equivalent Evaporation per hr (p)÷hrs.: 197.5

r. Output in Sq. Ft. of Radiation (q)×970.4÷240: 798

Other side for additional remarks, fuel weights, residue and gas anal

Sample of Filled-In Log Sheet for New Fire Method

of recording gas analysis apparatus with Orsat Apparatus.

38. Results of all tests on one boiler shall be reported on Form D.

39. The following results referred to boiler output in square feet of steam radiation, taken from Form D shall be shown by curves on Form E:

(*A*)—Boiler and grate efficiency.
(*B*)—Temperature of gases leaving boiler.
(*C*)—Average firing interval.
(*D*)—Average attention interval.
(*E*)—Draft difference (smoke outlet minus ash pit).

Definitions of Terms Used in the Code

43. Boiler Efficiency is the percentage of the heat in the net dry fuel burned delivered at the boiler nozzle when the boiler is normally insulated.

44. Boiler and Grate Efficiency (Overall Efficiency) is the percentage of the heat in the net dry fuel burned plus the heat in the fuel fallen through the grate delivered at the boiler nozzle when the boiler is normally insulated.

45. Fuel Charge (Available Fuel) is the maximum amount of fuel that can actually be fired at one time and can be burned with proper boiler performance between firing intervals. It must be demonstrated during tests that the quantity cataloged by the manufacturer as Fuel Charge (Available Fuel) can actually be fired at one time upon a fuel bed that is sufficiently deep to ignite the Fuel Charge properly. The following values for weight of fuel per cubic foot shall be used for catalog purposes:

Anthracite	52.5
Bituminous	45.0
Coke	28.0

46. Fuel Capacity is the weight of fuel that must be left in the boiler to kindle a fuel charge plus the weight of fuel which can be fired at one time. When specifying fuel capacity, it is necessary to specify the kind of fuel. Fuel capacity is not the total weight of fuel that can be shoveled into the fuel and combustion space because there must be sufficient furnace volume in addition to that occupied by the fuel to permit the escape of the gases leaving the fuel.

47. Calorific Value is the number of B.T.U. per pound of dry fuel as determined in a bomb calorimeter.

48. Clinker.—(Item 19, Form D) is the weight of clinkers which must be removed through fire or clinker doors. It does not include any clinker that drops into ash pit either during normal operation or when grates are shaken.

49. Residue.—(Item g, Form A) is the weight of the contents of the fire box when ending a test in the new fire method.

50. Cleanings.—(Item g, Form A) is the weight of material that drops through or is shaken through the grate into the ash pit.

51. Combustible per Pound of Fuel from Analysis.—(Item l, Form A) equals one minus the weight of ash obtained from the analysis of the dry fuel.

52. External Surface (Form A and Form B) is the measured surface of the boiler which is normally insulated in an installation.

53. Radiation from Covered Boiler Item ll, Form D) is the heat lost through insulated surfaces of the boiler. It is not included in boiler output but is shown on Form D to give the manufacturer an idea of the extent of this loss.

54. Heat Loss from Uncovered Boiler (Item n, Forms A and B) is the heat lost from that part of the boiler surface not insulated during test which could be saved by the normal insulation of the boiler in practice and which therefore would appear as added output.

55. Heat Loss from Uncovered Piping

Computations

40. Form A.

Item (b) = The factor 0.4 is the weight of coal equivalent in calorific value to 1 lb. of wood.

Item (n) = (External Boiler Surface) × (1.8) × ($T_s - T_r$) × (hrs.) × 1/971.7.
1.8 = (Coef. of uncovered boiler surface—coef. of covered boiler surf.)
= B.T.U./sq. ft./hr. deg. fahr. diff. of surface and room.
T_s = Surface temperature = steam temperature.
T_r = Room temperature.
hrs. = Duration of test.

Item (o) = Surface × 2.4 × ($T_s - T_r$) × (hrs.) × (1/971.7).
(Surface) = External surface of pipe in sq. ft.
2.4 = Average coefficient for uncovered pipe.
T_s = Steam temperature.
T_r = Room temperature.
hrs. = Duration of test.

$$\text{Item (t)} = \frac{\text{Item (p)} \times 971.7}{\text{Item (i)} \times \text{(Calorific value)}} \times 100$$

$$\text{Item (u)} = \frac{\text{Item (p)} \times 971.7}{[\text{Item (i)} + \text{Fuel through grate}] \times \text{(Calorific value)}} \times 100$$

41. Form B.

Item (h) = 14,600 = Calorific value of 1 lb. carbon.
It is assumed that the combustible in ash is carbon.

$$\text{Item (u)} = \frac{\text{Item (p)} \times 971.7 \times 100}{\text{Item (c)} \times \text{Calorific value}}$$

Item (n), (o) and (t) same as shown under Form A.

42. Form D.

$$\text{Item 8} = \frac{\text{Fuel through grate}}{\text{Dry fuel burned} + \text{fuel through grate}} \times 100 \text{ (New Fire Method)}$$

or

$$\frac{\text{Fuel through grate}}{\text{Dry fuel fired}} \times 100 \text{ (Continuous Fire Method)}$$

$$\text{Item 9} = \frac{11\,CO_2 + 8\,O_2 + 7\,(CO + N_2)}{3\,(CO_2 + CO)} \times \frac{C \times 0.24 \times (T_f - T_r)}{\text{Calorific value}}$$

CO_2, O_2, CO and N are in o/o by volume obtained and
C is taken as per cent carbon by weight per pound of fuel.
T_f = Temperature of gases leaving boiler.
T_r = Room temperature.

$$\text{Item 10} = \frac{CO}{CO_2 + CO} \times C \times \frac{10{,}160}{\text{Cal. value}} =$$

CO_2, CO and C same as for Item 9.

$$\text{Item 11} = \frac{\text{Surf. of boiler} \times \text{Coef. of covered boiler surface} \times (T_s - T_r) \times 100}{\text{Fuel burned per hour} \times \text{Calorific value}}$$

$$\text{Item 17} = \frac{\text{Fuel charge} \times \text{(boiler and grate efficiency)} \times 12{,}500}{\text{Output} \times 240}$$

$$\text{Item 18} = \frac{\text{Hours}}{\text{Times given attention}}$$

$$\text{Item 19} = \frac{\text{Weight of clinker removed}}{\text{Dry fuel burned} + \text{Fuel through grate}} \times 100 \text{ (New Fire Method)}$$

or

$$\frac{\text{Weight of clinker removed}}{\text{Dry fuel fired}} \times 100 \text{ (Continuous Fire Method)}$$

SHEET NO. ——— OF ——— SHEETS Form B

BOILER ROOM LOG SHEET—CONTINUOUS FIRE METHOD

BOILER: Name and Number; Description; Manufactured by; Object of Test

DESIRED OUTPUT: Sq. Ft.; % of Rating; Lbs. of Water

Date of Test; Serial No.; Test No.

Fuel: Kind; Size

Chimney: Size (dia.) Height (ft.)

Induced Draft

FUEL ANALYSIS

Proximate %		Ultimate %	
Volatile Matter		Carbon	
Fixed Carbon		Hydrogen	
Ash		Nitrogen	
Sulphur		Oxygen	
		Sulphur	

Calorific Value B t u per lb

Steam Outlets Used: No. Size (ins.) Location

Grate Area (sq. ft.) Heating Surface (sq. ft.)

External Surface (sq. ft.)

Fuel Depth—Beginning and end of test			inches
a.	Total fuel as fired		
b.	Moisture in fuel	%	lbs.
c.	Total dry fuel fired		(a)−(b)
d.	Cleanings from ashpit		
e.	Clinker from fire box		
f.	Total cleanings		(d)+(e)
g.	Combustible in total cleanings	%	lbs. (g)×14500
h.	Fuel equivalent of combustible in cleanings		cal. value
i.	Net dry fuel burned		(c)−(h)
j	Dry fuel burned per hour		(i)÷hrs.
k.	Dry fuel burned per hour per sq. ft. grate		(j)÷G.A.

	TIME			WATER (LBS.)			DRAFTS (ins. H_2O)					TEMPERATURES °F				
	Hr of Test	Hrs	Min	Reading on Tank Gauge	Reading on Tank Gauge	Evap between readings	Evap per hour	Total Evap from start of Test	In smoke Outlet	In Fire box	In ash pit	Barom. Pressure Ins. Hg	Steam Pressure Lbs. per Sq. In.	Feed Water	Steam	In Smoke Outlet	Boiler Room	Outside Air
Total																		
Average																		

POUNDS

m.	Actual evaporation x factor of evaporation			
n.	Corrections: Heat loss from uncovered boiler			
o.	Heat loss from uncovered piping			
t.	Boiler Eff.	%	p. Total Equivalent Evaporation	(m)+(n)+(o)
			q. Equivalent Evaporation per hr.	(p)÷hrs.
u	B & G Eff.	%	r Output in Sq. Ft. of Radiation	(q)×970.4÷240
			s. Evaporative Power	(p)÷(i)

Other side for additional remarks, fuel weights, residue and gas anal

Continuous Fire Method Log Sheet

(Item o, Form A and Form B) is the heat that is lost through uncovered piping (if condensation resulting drains back to the boiler and is re-evaporated) because the surfaces thereof are not normally insulated as specified in code. This correction is required only when piping cannot be insulated.

56. Coefficient of Covered Boiler Surface is the quantity of heat expressed in B.T.U. transmitted from the steam and water in the boiler to the boiler room per sq. ft. of normal insulation per hour per degree difference in temperature between the steam and the boiler room.

57. Actual Evaporation is the actual weight of water heated from the average feed temperature to average steam temperature and evaporated into steam during a test.

58. Factor of Evaporation is the total number of B.T.U. absorbed per pound of water evaporated divided by 971.7.

59. Total Equivalent Evaporation (Item p, Form A and Form B) is the quantity of water which would have been evaporated from a feed water temperature of 212° into steam at 212° by the corrected heat output delivered at the boiler nozzle.

60. Boiler Output is the quantity of heat available at the boiler nozzles with the boiler normally insulated.

61. The Square Foot of Steam Radiation is the heat output of 240 B.T.U. per hr.

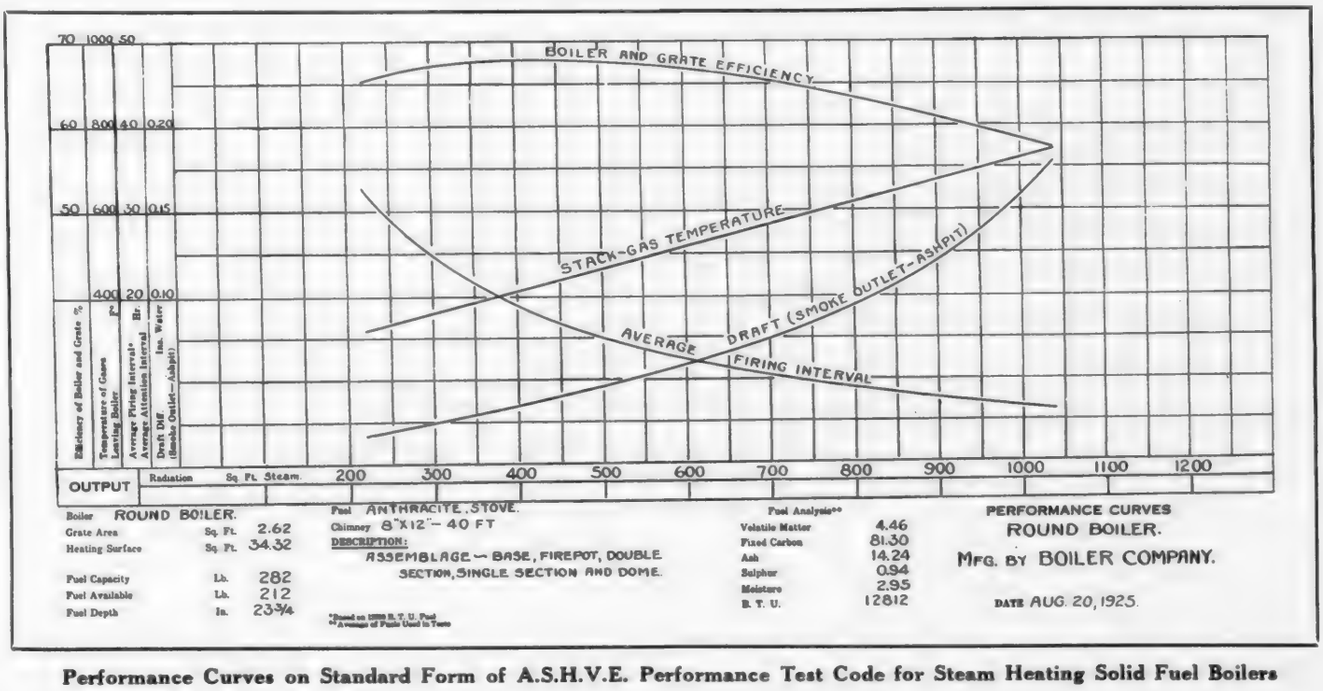
62. A Damper is a device used to control the flow of air or gases in a boiler.

63. A Choke Damper is a damper placed within the gas passage.

64. A Check Damper is a device for admitting air from the boiler room to the gas passage or smoke pipe.

Gas House-Heating Increases

Data issued by the statistical department of the American Gas Association shows that for the first four months of 1929, gas house-heating sales in the state of Michigan increased 77% over the corresponding period of 1928, while Massachusetts and Wisconsin showed increases of 64% for this phase of gas sales activity for the same period.



Performance Curves on Standard Form of A.S.H.V.E. Performance Test Code for Steam Heating Solid Fuel Boilers

Proposed Revision of A.S.H.V.E. Boiler Rating Code

A REVISION of the January, 1929, A.S.H.V.E. Boiler Rating Code, as proposed by the Continuing Committee on Codes for Testing and Rating Steam Heating Solid Fuel Boilers at the summer meeting of the society at Bigwin Inn, Canada, June 28, is presented herewith.

The revision is exceedingly short and to the point. Apparently the manufacturers of cast-iron boilers are in accord with the new code, but several objections have been made by members of the American Boiler Manufacturers Association, representing 95% of the steel heating boiler industry.

Action on the report of the Continuing Committee was not taken at the summer meeting, as it was felt that the attendance was too small to justify action on such an important subject. The proposed revision will be submitted to the members of the society at the annual meeting in Philadelphia, January 27-31, 1930.

Prepared and signed by L. A. Harding, chairman, R. V. Frost, and F. C. Houghten, the rating code, as submitted, follows:

Proposed Revision of the January, 1929, A.S.H.V.E. Code for Rating Steam Heating Solid Fuel Boilers

(1) PURPOSE

The purpose of this Code is to standardize the method to be employed and followed by any person, partnership, firm, corporation or association, who may desire to make use of, or employ for any purpose, whatsoever the statement, "The ratings of the boilers herein listed are in accordance with the provisions of the A.S.H.V.E. Code (year) for Rating Steam Heating Boilers Burning Solid Fuel."

(2) RATING DESIGNATION

It is understood that all ratings stated are boiler outputs for the corresponding boiler designation as were determined and defined by the provisions of the "A.S.H.V.E. Performance Test Code for Steam Heating Solid Fuel Boilers (year)" and as governed by the conditions as set forth under paragraph 4 and accompanying the ratings.

The output for each boiler shall be stated in thousands of B.T.U. per hour and also in square feet of equivalent direct radiation. It shall be optional to state, in addition to the two methods indicated, the output in pounds of steam per hour.

(3) RANGE OF OUTPUTS FOR EACH BOILER LISTED

There shall be stated a minimum number of five boiler outputs for each boiler listed. The outputs shall have a range from maximum output to approximately 35% of the maximum output and the intermediate outputs given are to be approximately equally spaced between the minimum and maximum outputs.

(4) LIST OF CONDITIONS, STATEMENTS OF LIMITING CONDITIONS AND MANUFACTURER'S GUARANTEE

There shall be stated under each output listed the numerical values for each of the following five items:

1. Fuel available in hours.
2. Combustion rate pounds per hour per square foot of grate surface.
3. Overall efficiency per cent.
4. Average draft tension, inches water.
5. Interior dimensions of chimney and height.

The following statements shall be included under each table of rating. "The priming for any output listed above does not exceed 2%.

For Anthracite Fuel

"The ratings are based on a steam pressure of 2 lb. gauge at the boiler and anthracite coal stove size, having a calorific value of 12,500 B.T.U. per lb. on a moisture free basis."

For Bituminous Fuel

"The ratings listed are based on a steam pressure of 2 lb. gauge at the boiler and bituminous coal 3 in. by 2 in. size, having a calorific value of 13,000 B.T.U. per lb., sulphur content not exceeding 2% and volatile content of not less than 30% on a moisture free basis."

For Coke Fuel

"The ratings listed are based on a steam pressure of 2 lb. gauge at the boiler and byproduct or gas coke of commercial size best suited to the boiler."

"The inside dimensions and height of chimneys listed should be satisfactory when properly constructed and having no other opening except for the purpose of serving the boiler and when free from the effect of adverse air currents. Allowance should be made for any other chimney openings, elbows in the smoke flue or breeching and for extra long smoke flue or breeching."

(5) TABLE OF DIMENSIONS

A comprehensive table of dimensions of the boilers listed shall be included in the same bulletin or catalog with the ratings. This table shall include the number and pipe size of steam and return connections and location, smoke flue dimensions and height above floor line, grate area and height of boiler water line and such other dimensions as may be required for properly indicating the boiler to scale on a set of complete heating installation plans.

(6) DEFINITIONS

Purchaser:

Construed to mean the person responsible for the selection of the boiler.

Manufacturer:

The individual, firm or corporation who manufactures the boilers for which corresponding ratings are listed.

Boiler Output:

As defined by the proposed A.S.H.V.E. Performance Test Code for Steam Heating Solid Fuel Boilers.

Estimated Maximum Load:

Construed to mean the load stated in B.T.U. per hour or equivalent direct radiation that has been estimated by the purchaser to be the greatest or maximum load that the boiler will be called upon to carry.

Equivalent Direct Radiation:

Construed to mean the heat emission of 240 B.T.U. per sq. ft. of manufacturer's rated surface of direct steam radiation and 150 B.T.U. per hr. per sq. ft. of manufacturer's rated surface of direct hot water radiation.

Grate Area:

As defined by the A.S.H.V.E. Code for Testing Low-Pressure Steam Heating Solid Fuel Boilers.

Fuel Available in Hours:

Construed to mean the hours required to burn one available fuel charge. The available fuel is defined by the proposed A.S.H.V.E. Performance Test Code for Steam Heating Solid Fuel Boilers.

Overall Efficiency:

As defined by the proposed A.S.H V.E. Performance Test Code for Steam Heating Solid Fuel Boilers.

Priming:

The amount of free moisture carried by the dry saturated steam vapor delivered by the boiler stated as a percentage of the total weight of the sum of the dry saturated steam plus the free moisture delivered.

A conference was held June 20, with representatives from the society's committee, the National Boiler and Radiator Manufacturers Association and the American Boiler Manufacturers Association. As a result of this conference the committee and the representatives of the National Boiler and Radiator Manufacturers Association agreed upon the draft of the code as presented above. However, representatives from the American Boiler Manufacturers Association did not agree with the code. Their views are expressed in the following letter:

Attitude of Steel Boiler Manufacturers

We, the undersigned manufacturers of low-pressure steel heating boilers, representing approximately 95% of the total steel heating boiler industry, object to the code for rating low-pressure heating boilers, as proposed by your committee, dated May 17, 1929. The objections are based on the following reasons:

1. The selection of boilers as based on the maximum capacity, would result in smaller steel boilers being used on a specific job as compared to present practice, with a consequent lowering of operating efficiency.

This code specifies minimum requirements, and it has been experienced that in similar codes, where minimum requirements are given, minimum requirements are used.

The present practice in selecting steel boilers gives a uniformly higher reserve capacity than as proposed by the code.

2. The proposed code does not consider heating surface, which is a prime essential in determining boiler capacity or ratings, and on which basis steel heating boilers have been rated and satisfactorily selected for a great number of years.

3. We object to the use of a multi-rating, as it would tend to cause confusion in an industry that has used but a single rating satisfactorily for a number of years.

4. We object to the use of anthracite fuel only as a basis for determining rating.

Our recommendations regarding the selection and rating of heating boilers are based on a practice which has proven to be satisfactory to both manufacturer and user throughout the entire life of the steel heating boiler industry, and are as follows:

(1) The published boiler rating shall correspond to the "estimated design load" as defined in Section 5 of the Code of Minimum Requirements, being the sum of Items A, B and C in Paragraph 1.

(2) The published boiler rating shall be determined by the amount of heating surface and grate area.

We are prepared to furnish your committee with exact information as to minimum ratios of rating to heating surface and heating surface to grate area to be employed in determining the rating for heating boilers.

Yours truly,

Kewanee Boiler Corp.
Pacific Steel Boiler Corp.
Heggie-Simplex Boiler Co.
Oil City Boiler Works
International Boiler Works Co.
Titusville Iron Works Co.
Fitzgibbons Boiler Co., Inc.
Ames Iron Works
The Brownell Co.
Erie City Iron Works

Replies to Committee's Questionnaire

A summary of the replies to a questionnaire sent out by the committee to boiler manufacturers and others interested in the subject is given in the outline below:

1. All are agreed that manufacturer should guarantee the listed ratings of the boilers manufactured under conditions of operation he may state and dimensions of chimneys given by him.

2. Several manufacturers apparently favor a one number rating, one of which states that while "it would be advisable to have a one number rating for price comparisons of boiler capacities, other capacities with performance characteristics are desirable."

Many of the answers given to this question are in effect, "we do not favor 'one number rating' with this exception, that, considering conditions in the industry and this is entirely a commercial reason, the one number rating would go to some length to insure uniform price."

3. The great majority of the replies received indicate that a "multi-number rating" is favored.

The Heating and Piping Contractors National Association express a preference for complete performance charts.

4. Practically all prefer to state boiler outputs in both B.T.U. per hour and square feet of equivalent direct radiation.

5. The consensus of opinion in reference to the statement of conditions that should accompany rating tables are practically uniform on the following items:

(1) Combustion rate.
(2) Firing period, attention or fuel available in hours.
(3) Overall efficiency.
(4) Draft tension.
(5) Dimensions of chimney.
(6) Fuel (kind not stated) 12,500 B.T.U. per lb.
(7) Grate area and chimney dimensions to be given.
(8) The majority of the answers omit flue gas temperature as a condition. One suggests a limit of 800° F.

The committee, after its meeting on May 4, formulated a tentative revision of the present A.S.H.V.E. Code for Rating Low-Pressure Heating Boilers, which was mailed to the same manufacturers and organizations that received the questionnaire. The proposed revision was accompanied by a copy of the committee's comments on the subject of boiler rating which follows:

GENERAL

A rating code for any type or kind of apparatus must of necessity include the following items:

1st—The output.
2nd—Specified conditions of operation for the output stated.
3rd—The limits placed on the specified conditions.

It is obviously necessary to standardize limits for some of the specified conditions, otherwise a rating code could not fulfill its function.

Some of the limits to conditions naturally are now set by custom and usage or by ordinances or laws, designed to protect the health and safety of the community.

For example: Custom and usage have decreed that the conditions relative to steam pressure for rating purposes, shall be 2 lb. gauge at the boiler for heating boilers, whereas, overall efficiency, draft tension, temperature of flue gas and rate of combustion are conditions over which it is difficult if not altogether impractical to assign definite limits in the present state of this art with the possible exception of flue gas temperature. This should naturally be limited to a maximum value consistent with safety relative to fire hazard.

Placing a minimum value limit on boiler efficiency covering the average load period of the heating season, would appear to be in line with a program of fuel conservation and probably receive a welcome by prospective owners of heating boilers.

Not the least item however, in boiler economy is the manner in which the boiler is actually operated by the owner and over which the manufacturer has no control.

The manufacturer can and does produce boilers which give relatively high efficiency when properly operated but who can set a minimum efficiency limit that would produce the actual results that are apparently desirable.

There are a number of terms employed in this art, the meaning of which is either vague, not clear or by no means standardized. We give below the definition of various terms as we understand them.

Purchaser:

Construed to mean the person responsible for the selection of the boiler.

Equivalent Direct Radiation:

The heat emission of 240 B.T.U. per hr. per sq. ft. of manufacturer's *rated surface* of direct steam radiation and 150 B.T.U. per hr. per sq. ft. of manufacturer's *rated surface* of direct hot water radiation.

One Number Rating:

A single rating stated for each boiler listed in a manufacturer's catalog.

Multi-Number Rating:

Two or more ratings stated for each boiler listed in a manufacturer's catalog.

Heating Boiler Output:

As defined by the proposed A.S.H.V.E. Performance Test Code for Steam Heating Solid Fuel Boilers.

Boiler Efficiency:

The overall efficiency of grate and boiler as defined by the proposed A.S.H.V.E. Performance Test Code for Steam Heating Solid Fuel Boilers.

Estimated Maximum Load, Peak Load, Starting-Up Load:

These terms are considered synonymous and construed to mean the load, stated either in B.T.U. per hour or equivalent direct radiation that has been determined by the purchaser to be the greatest estimated output that the boiler will be called upon to carry in operation. We recommend the use of the term estimated maximum load in this connection.

Net Load:

This term now has various meanings, all the way from the load of the radiation in normal operation to the maximum load. We recommend that this term be dropped from heating literature as serving no useful purpose.

Estimated Design Load:

The load, stated in B.T.U. per hour or equivalent direct radiation, as estimated by the purchaser for the conditions of inside and outside temperature for which the amount of installed radiation was determined and is the sum of the heat emission of the radiation to be actually installed plus the allowance for the heat loss of the connecting piping plus the heat requirements for any apparatus connected with the system.

Estimated Average Load:

The estimated average load stated in B.T.U. per hour or equivalent direct radiation for the heating season and based on the average outside temperature during the heating season for the locality in question.

Heating-Up Factor:

The percentage added to the estimated design load in determining the estimated maximum load.

Attention, Firing Period, Fuel Available in Hours:

The hours required to burn one available fuel charge. *Fuel available* is defined in the proposed performance boiler test code. We recommend the discontinuance of the use of the terms *attention* and *firing period.*

Load Rating Versus Output Rating:

These terms are not synonymous as now employed by various manufacturers. Some manufacturers prefer to include in their rating the allowance for the heat loss of connecting piping, or the heating-up factor or both, in either case the ratings stated are obviously not the boiler outputs required for either the estimated design load or the estimated maximum load, but are evidently some lower figure.

It does not appear to the committee that the boiler manufacturer should assume the responsibility of guaranteeing a rating based on the use of some heating-up factor of which the purchaser has no definite knowledge.

We believe the responsibility for the selection and application of a heating-up factor lies entirely with the purchaser just as much as it is his responsibility for determining the estimated design load. If he is capable of the latter he surely should be and is naturally capable of the former.

If a manufacturer includes in his literature the necessary heat transmission data for calculating the estimated design load he might very properly include a table of heating-up factors.

He does not guarantee the former so why should he guarantee the latter.

We do not see that the necessary process of selecting a boiler for a given load is in any way simplified by including in the published rating designation allowances for various items of estimated value.

Boiler outputs are something quite tangible when determined by a uniform test code, whereas boiler loads are only estimates.

If all ratings stated in catalogs were boiler outputs as determined by the provisions of the test code, the boilers of various manufacturers would evidently be more easily compared, which overcomes one of the greatest objections frequently referred to as the existing confusion in boiler ratings.

In the interest of uniformity in catalog listing, this committee recommends that all ratings be stated in terms of boiler outputs. The terms, boiler load rating and boiler output rating, would then be synonymous and we see no reason for employing the term boiler load rating.

Range and Number of Boiler Outputs Desirable per Boiler:

If the purchaser is to have any very definite idea of the economy of the boiler he proposes to install he naturally should be provided with the efficiency corresponding to the average output as determined by and equal to the estimated average load estimate. This is the lowest output that there would be any very good reason to list.

The estimated average load in localities where heating is important is frequently assumed to be approximately 35% of the estimated design load.

If the heating-up factor is assumed as 65%, then the "estimated maximum load" becomes 165% of the estimated design load and the estimated average load is 21.2% of the "estimated maximum load."

It is recognized that these percentages are somewhat variable but it would appear reasonable to assume that the minimum output listed for a particular boiler should bear some relation to the maximum listed output and we suggest that approximately 20 to 25% be employed in this connection. Thus, if 25% was used the fuel available in hours for the minimum output would be 6.6 times that of the maximum output listed.

It is recommended that at least five outputs be given with the corresponding conditions for each boiler listed in order that those who are interested in the use of boiler performance charts may have the desired information to plot such charts. This would require listing three outputs fairly equally spaced between the minimum and maximum.

"Fuel Available in Hours" for Maximum Output:

If 8 hrs. be considered a desirable time as set by custom and usage for the smaller size boilers to employ for the design load, then on the basis of a 65% heating-up factor the fuel available in hours for maximum output becomes 4.84 hrs. If 6 hrs. is satisfactory for the larger boilers to employ for the design load the fuel available in hours for maximum output becomes 3.7 hrs.

In the interest of uniformity in rating it would be well to place some limits on the fuel available in hours for the maximum outputs listed, although we have no recommendations to make at this time.

Flue-Gas Temperature:

It is coming to be more generally recognized that flue gas temperature *is not* a reliable indicator of efficiency and in many cases only remotely connected with efficiency.

The information in reference to both the temperatures of flue gas and draft tension is, we believe, necessary, particularly for boilers of the larger size.

The purchaser must have this information if he is to be able to perform the necessary calculations in determining satisfactory chimney or stack dimensions.

This is more particularly true for boiler installations serving high buildings.

If only draft tension is stated the purchaser is left to make his own estimate as to stack temperature. The manufacturer should be as much concerned in the satisfactory operation of the installation as the purchaser, and this is hardly possible unless a proper size chimney or stack is provided by the purchaser.

Society Holds Largest Summer Meeting Since 1923

AT the summer meeting of the American Society of Heating and Ventilating Engineers, held at Bigwin Inn, Lake of Bays, Can., June 26-28, 380 members and guests were registered. This was the largest attendance at a summer meeting of the society since 1923, when a joint meeting was held at Chicago in conjunction with the Heating and Piping Contractors National Association.

Meetings were well attended and the papers excited considerable discussion. At the golf tournament, L. J. Pitcher, of the Illinois Engineering Co., Chicago, won the Research Cup for the second time.

In the discussion on J. H. Parkin's paper, "Instruments for the Measurement of Air Velocity," which was read by John Aeberly, W. A. Rowe, chief engineer of the American Blower Corporation, stated that a crying need exists for a simple method for calibrating anemometers. Prof. A. P. Kratz emphasized that there is at the present time no easy or simple method of measuring low air velocities in the field.

Following the mention by F. C. Houghten that the Chicago Sheet Metal Contractors Association is cooperating with the Armour Institute of Technology in carrying on research into the existing methods of measuring low air velocities, W. H. Carrier urged that the society be careful in adopting any code or accepting data on this subject until the members are certain that the right step is being taken. He suggested that the Research Laboratory has an opportunity to render a great service along these lines.

Eugene D. Milener, of the American Gas Association, mentioned that the testing laboratory of the association, after considerable experimental work, adopted the Thomas meter for measuring air velocities, accurate to 1% to 1½%.

Professor Kratz brought out, in the discussion of his paper, "Analysis of the Overall Efficiency of a Residence Heated by Warm Air," that the small heating plant is a great deal more efficient than generally is believed. The point is that stray heat from radiation and other causes is not entirely lost, inasmuch as it eventually aids in heating the building as a whole. The question was raised as to whether the efficiency of the heating system in the Research Residence was calculated on figures for the coal fired or the coal burned. Professor Kratz replied that these calculations were made on the coal burned.

R. V. Frost stated that the figures presented emphasized that coal-fired heating plants can give much higher efficiencies than are credited to them by the salesmen of oil and gas-fired equipment. Stoker tests in the Frost Laboratory have shown efficiencies of stoker-fired plants as high as 85%. Homer R. Linn, of the American Radiator Company, asked what the temperature difference was in the residence between the floor and the ceiling. The reply was that on the first floor the temperatures were from 12° to 15° lower on the floor than at the ceiling, while, on the second floor, the difference was 16°.

L. M. Arkley, professor of mechanical engineering at Queen's University, Kingston, Ontario, said that the chief criticism of warm-air systems is that they give a poor distribution of heat. Professor Kratz replied that the maximum temperature difference at the breathing-line from room to room did not exceed 3°, and that it made no particular difference whether the inside doors were open or closed. He further remarked that there are, as yet, no available figures as to the relative efficiencies of steam and warm-air systems.

At the second session a resolution of appreciation of the work of the late Edwin S. Hallett was adopted, and a copy of the resolution bound in leather was sent to his family.

In discussing the tables included in "Errors in the Measurement of the Temperature of Flue Gases," by Percy Nicholls and W. E. Rice, R. V. Frost called attention to the small difference between the temperatures recorded by thermocouples and thermometers.

Prof. F. E. Giesecke and Elmer G. Smith, both of the Engineering Experiment Station, Agricultural and Mechanical College of Texas, presented an unusually interesting paper, "Pipe Sizes for Hot Water Heating Systems." The paper contained a description of the test equipment and procedure. The object of the tests was to secure data which could serve as a basis for pipe-sizing tables for water systems. The conclusions, tables, and suggestions for their use are given in the part of the paper following:

Pipe Sizes for Hot Water Heating Systems

Outstanding among the results of this investigation is the discovery that, for the type of system studied, the pressure heads produced by the individual radiators with their connecting pipe lines may be so large when compared with the pressure head produced by the heater with its main flow and return risers that they may interfere seriously with the proper circulation of the water in a gravity flow system of the type used in this investigation, if the pipe system has not been accurately designed and built. These disturbing effects of the radiator pressure heads are particularly active during the heating-up periods of the operation of the heating systems.

The operation of a one-pipe water system is so simple and so positive that it is comparatively easy to design and to install such a system, and it seems that it should be possible to prepare tables according to which pipe sizes and radiators can be determined with sufficient accuracy.

The following sets of tables and rules are proposed for this purpose.

Table 1 is based on a temperature drop of 35° through the system. Table 2 is based on a temperature drop of 25°.

Both tables are based on a head of 3 ft., 6 in.; i. e., on a vertical distance of 3 ft., 6 in. from the main to the center of the heater. If the distance is greater, the system will function better than indicated by the tables.

Both tables are based on the assumption that the main is covered. If the main is bare, the farther radiators will not be as efficient as the tables imply.

TABLE 1. CAPACITIES IN 1,000 B.T.U. OF MAINS FOR ONE-PIPE SYSTEMS FOR A TEMPERATURE DROP OF 35° AND A HEAD OF 3 FT. 6 IN.*

Length of Horizontal Mains	Pipe Sizes—In.							
	1½	2	2½	3	3½	4	5	6
50	37	68	98	171	245	327	580	888
75	32	59	87	151	222	298	527	818
100	28	53	79	138	204	278	487	774
125	26	48	73	129	191	261	460	736
150	23	45	68	121	179	245	437	700
175	22	42	65	114	169	231	415	670
200	21	40	61	107	158	216	394	638
225	20	38	58	101	149	203	374	608
250	19	36	55	95	140	190	354	580

*If the head is more than 3 ft. 6 in., the values given in this table may be increased.

For both tables, the friction head calculations were based on the "Length of the Horizontal Main," listed in the tables, plus 10 ft. of pipe and 10 elbow equivalents for risers and connections. These additions were assumed to be representative of the ordinary installations.

A comparison of Table 1 with Table 2 shows that the size of the main must be increased as the temperature drop through the system is decreased. For example, for a system delivering 200,000 B.T.U., with a length of horizontal pipe of 150 ft., a 4-in. main is required if the temperature drop is to be 35°., and a 5-in. main, if the temperature drop is to be 25°.

It will be shown below that, as the size of the main increases, the average size of the radiator decreases, thereby offsetting the increased cost of the main and conserving floor space.

Table 3 shows the capacities of risers for first, second, and third floor radiators. The table is based on the assumptions that the vertical distance of the first floor above the main is about 20 in., that the story heights are about 9 ft., that the individual resistances in every radiator circuit are approximately equivalent to 14 elbows, and that the temperature drop through each radiator will be 20° or less.

TABLE 3. MAXIMUM CAPACITIES IN B.T.U. OF RISERS FOR ONE-PIPE SYSTEMS*

Size, In.	First Floor	Second Floor	Third Floor
¾	2,500	6,000	7,000
1	5,000	11,000	12,000
1¼	9,000	20,000	24,000
1½	12,000	.....	.....
2	21,000	.....	.....

*If valves are installed in the radiator circuits, they should be of the same size as the pipes. If smaller valves are used, they will introduce larger friction heads than were included in the calculations on which the table is based.

Tables showing the capacities of risers supplying more than one radiator can be prepared, but it is considered best not to propose such tables until after corresponding installations have been made and tested.

Rules for Determining Sizes of Radiators for One-Pipe Systems

The correct method of finding the sizes of radiators for one-pipe systems is to assume the total temperature drop through the system and, having done that, to calculate the successive partial drops in temperature which occur in the main at the several return risers. Knowing these partial temperature drops find, *first*, the temperature of the water in every flow riser, *second*, the average temperature of the water in the radiator, *third*, the value of *k* for the particular temperature difference—water to air,—and, *fourth*, the corresponding radiator size.

Using this method in designing a system in which there are 16 sets of risers, it will be necessary to make 16 sets of calculations. This method may be unnecessarily refined and it may be sufficiently accurate to use the following approximate method: Divide the system into four sections so that the radiators in each of the four sections deliver approximately the same quantity of heat to the building. Number the four sections consecutively in the order in which the water flows, so that Section 1 receives the hottest and Section 4 the coldest water. Calculate the sizes of the several radiators in the usual way and then multiply the calculated sizes by the factors shown in the following tabulation:

For a total temp. drop of	Sec. 1	Sec. 2	Sec. 3	Sec. 4
35°	1.00	1.15	1.30	1.45
25°	1.00	1.10	1.20	1.30

To illustrate the use of the tables and rules proposed above, let it be required to design the one-pipe system shown in Fig. 1.

There are seven radiators delivering, together, 71,000 B.T.U. per hr.

The length of horizontal main is 160 ft.

Let us adopt 25° as the total temperature drop.

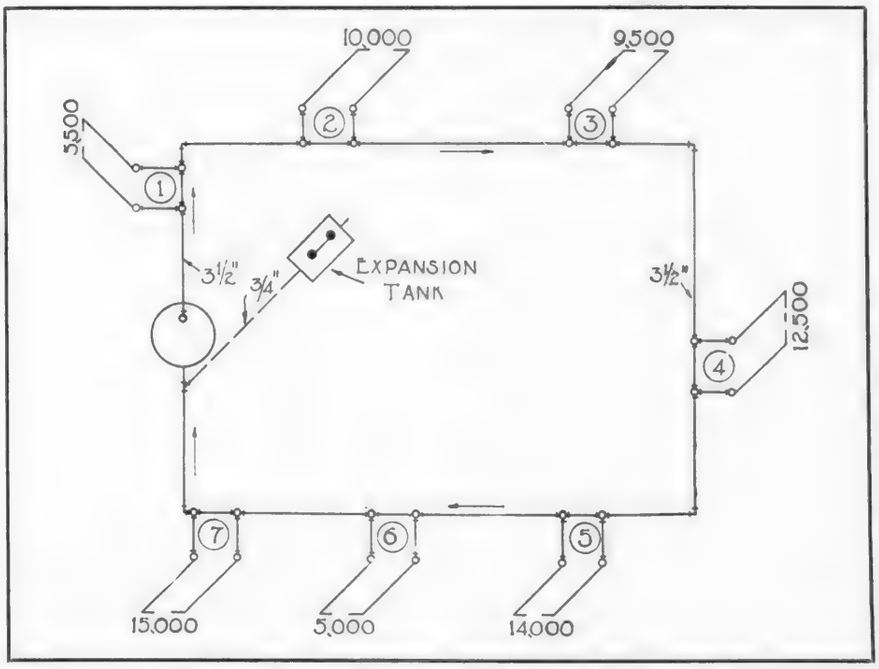
To find the size of the main: From Table 2, a 3 in. pipe is slightly too small and a 3½ in. pipe too large. We could construct the main partly of 3 in. and partly of 3½ in. pipe; or, if the main can be installed more than 3 ft. 6 in. above the center of the heater, we could use a 3 in. pipe. It may be best to adopt the 3½ in. pipe in this case.

To find the sizes of the risers: From Table 3, the largest radiator, No. 7, having a heat output of 15,000 B.T.U., will need a 2-in. riser if locat-

TABLE 2. CAPACITIES IN 1,000 B.T.U. OF MAINS FOR ONE-PIPE SYSTEMS FOR A DROP IN TEMPERATURE OF 25° AND A HEAD OF 3 FT. 6 IN.*

Length of Horizontal Mains	Pipe Sizes—In.						
	2	2½	3	3½	4	5	6
50.....	41	59	100	140	195	346	552
75.....	35	51	90	130	179	320	500
100.....	31	48	83	121	165	293	450
125.....	30	44	75	113	153	280	425
150.....	27	40	70	104	143	265	405
175.....	25	38	66	98	136	252	390
200.....	24	35	63	93	130	239	377
225.....	23	34	61	90	125	225	367
250.....	22	33	60	88	120	223	358

*If the head is more than 3 ft. 6 in., the values given in this table may be increased.



Water System Designed as Explained in Text

ed on the first floor, and 1¼ in. risers if located on the second or third floor. The smallest radiator, No. 6, having a heat output of 5000 B.T.U., will need 1-in. risers if located on the first floor; and a ¾-in. riser if located on the second or third floor.

To find the sizes of the radiators: Let us assume that the water leaves the heater at a temperature of 210° when the system is delivering 71,000 B.T.U. and that the radiators are operating with a temperature drop of 20°. The average water temperature in Radiator 1 then will be 200°, and the temperature difference — water to air—will be 130°. For this temperature difference, and for a 38-in. 3-col. radiator, the value of *k* is 1.36, and the heat transmission is 1.36 x 130, or 176.8 B.T.U. per sq. ft. Consequently, if all radiators receive water at the same temperature as Radiator 1, the radiator sizes would be as follows: No. 1, 28; No. 2, 57; No. 3, 54; No. 4, 71; No. 5, 79; No. 6, 28; and No. 7, 85 sq. ft.

To divide the heating system into four sections, so that each section delivers, approximately, the same quantity of heat; we would probably place Radiators 1 and 2 in Section 1, Radiators 3 and 4 in Section 2, Radiators 5 and 6 in Section 3, and Radiator 7 in Section 4. Multiplying the radiator sizes calculated above by the factors shown under the rules for determining radiator sizes, namely: 1.00, 1.10, 1.20, and 1.30, when the total temperature drop is 25°, we find the following sizes: No. 1, 28; No. 2, 57; No. 3, 59; No. 4, 78; No. 5, 95; No. 6, 34; and No. 7, 110 sq. ft. These calculated sizes must be changed to the nearest stock sizes available.

Following his presentation of the paper, Professor Giesecke, by the use of blackboard diagrams, illustrated his explanation of some of the points brought out in the paper. This discussion, as stated by President Lewis, "kept everyone on his mental toes."

S. R. Lewis, chairman of the "Guide" Committee, reported that there will be 39 feature chapters in the next edition of the *Guide*, 30 of which already are prepared.

At the third session, there were numerous comments on the paper by Prof. F. B. Rowley and John Beal, of the University of Minnesota, "Determining the Quantity of Dust in Air by Impingement." Included in the discussion was a letter from Margaret Ingels, of the New York Commission on Ventilation, in which Miss Ingels stated that it was important that all the dust should be removed from air which is being cleaned, and for this reason the accurate determination of quantity is necessary so that the efficiency of the filter or washer can be determined. Several other members commented on this point.

In his reply, Professor Riley pointed out that there can be no absolute determination of dust quantities. Dust of a certain size may be removed 100% from air but it will still have large quantities of particles of smaller size.

Report of Committee on Heating and Ventilating Garages

At the session held June 28, the report of the Committee on Code for Heating and Ventilating Garages was presented and discussed. In May, 1928, the National Fire Protection Association adopted tentative regulations governing the construction and operation of bus garages, prepared by its Committee on Garages. Sections 15 to 19 of this code were prepared by a committee of the society, consisting of E. K. Campbell, W. H. Carrier, E. B. Langenberg, and Thornton Lewis. These sections appear in the following abstract from the association's code, and appeared in the committee's report presented at the meeting.

Section 15.

(a) Heat generating plants should preferably be located in a detached building. If within the garage, the heat generating plant shall be placed in a separate room used for no other purpose and cut off horizontally and vertically from all other parts of the building by reinforced concrete walls not less than 6 in. thick, or masonry walls not less than 8 in. thick.

Openings in such walls shall be restricted to those necessary for heating pipes and ducts, which openings shall be made tight in a manner to provide for expansion and at the same time prevent air passing through the walls. Entrance to room containing the firing space shall be from the outside only.

All air entering the heat generating plant for combustion purposes shall be drawn from outside the building.

(b) Sufficient heating capacity shall be provided to maintain an inside temperature of not less than 40° F. in the coldest weather and to maintain a temperature of not less than 35° at the warm air inlet when the ventilating system is in full operation for flushing purposes.

(c) No method of heating shall be used which permits fire in the garage or in any communicating room.

(d) Motors used in connection with heating system shall be of the constant speed type. All switches and motors shall be of approved design and installed in compliance with the

National Electrical Code. Polyphase motors shall be protected against single phase operation.

(e) The use of steam or hot water heating systems by either direct or indirect radiation is permitted, provided the requirements of the ventilating section of these regulations are complied with. Inside air inlets for indirect radiation shall not be higher than 2 ft. above the floor.

(f) Unit heaters employing steam or hot water are permitted provided the requirements of the ventilating section of these regulations are complied with.

(g) Steam blast systems with central fan and coils together with ducts are permitted provided the requirements of the ventilating section of these regulations are complied with. The heating coils of such systems shall be separated from the firing space by masonry walls at least 8 in. thick.

(h) Warm-air furnace blast systems of heating are permitted provided the requirements of the ventilating section of these regulations are complied with. The air space surrounding the furnace within the heating chamber shall be separated from the firing space by a masonry wall at least 8 in. thick or other wall of material and thickness which may be approved by the Underwriters. This wall may be formed in part by the furnace front, which must be not less than ¼ in. thick, of steel or cast-iron and this furnace front may be pierced only by the feed and ash pouches of the furnace, and by clean-out doors opening into the combustion space or smoke passages. Access doors through either brick wall or furnace front shall not be permitted. Warm-air furnaces other than blast systems shall not be permitted.

(i) Positive recirculation of 1 cu. ft. of air per sq. ft. of floor area within the garage shall be provided in all garages having an average ceiling height of not more than 15 ft. and in all garages having greater ceiling height than 15 ft. the volume of air recirculated shall be increased in proportion to the increase in height. The return air openings in such recirculating systems shall be not more than 2 ft. above the floor.

(j) In central furnace fan plants, not less than 5% of the air moved by the fan shall be taken direct from outside of the building through a duct which shall deliver the outside air to a point near the floor on which the fan rests; the duct shall be open at all times and the air supply which is provided shall be without control.

(k) All fans used for recirculating air within the garage or exhausting air from the garage shall be of non-sparking type.

Section 16. Ventilation of Storage Sections.

(a) These regulations shall apply to the following garages:

1. Garages housing 35 or more motor vehicles with three or more walls pierced with openings.

2. Garages housing 25 or more motor vehicles with two walls pierced with openings.

3. Garages housing four or more motor vehicles and located above ground, but having less than two walls pierced by openings and exposed to the outside.

4. Garages housing four or more motor vehicles and located below level of the ground.

(b) Natural ventilating may be employed where it is practicable to maintain open windows or other openings at all times. Such openings shall be distributed as uniformly as possible in at least two outside walls. The total area of such openings shall be equivalent to at least 5% of the floor area.

(c) Where it is impracticable to operate such a system of natural ventilation, a mechanical system of ventilation shall be provided. This system may be combined with the heating system or may be an entirely separate installation.

(d) Positive provision shall be made for either the inlet of 1 cu. ft. of air per min. from out-of-doors for each square foot of floor area, or for removing the same amount and discharging it to the outside as a means of flushing the garage.

(e) For the purpose of these regulations, positive means of handling air shall be understood to mean a power-driven fan or fans of sufficient capacity to move the required volume of air.

(f) Where positive systems of exhausting air are used, the exhaust openings shall be not more than 24 in. above the floor and shall be not more than 50 ft. apart.

(g) Garages having a capacity of not less than four or not more than 35 cars within the scope of these regulations may consider air exhaust stacks as positive, provided they have not less than 15 sq. ft. of steam heating surface for each square foot of duct area, and not less than 1 sq. ft. of free area through both heating coil and duct for each 350 sq. ft. of floor area. Such an exhaust duct shall discharge above the roof and extend in any case to a height of not less than 15 ft. above the heating coils.

(h) Where mechanical systems of introducing outside air are used, and where air is recirculated, the air shall be delivered horizontally and in sufficient volume and with sufficient velocity to secure distribution to all parts of the building. The height of the air inlet opening shall be such that the air will be discharged above the top of the vehicles.

(i) All duct openings, either supply or exhaust, shall be covered with ¼-in. mesh screen.

(j) The passing of air ducts through fire walls shall be avoided wherever possible. Ducts shall be installed in accordance with the regulations for the installation of blower and exhaust systems.

Section 17. Repair Shops.

(a) Repair shops shall be ventilated as required for garage storage sections, except that mechanical means shall be provided for both the inlet and exhaust of 1 cu. ft. of air per min. per sq. ft. of floor area.

(b) In connection with engine testing it is recommended that the engine discharge direct to outdoors through a straight duct or pipe of incombustible material, and of suitable size, installed as an extension of the exhaust pipe or muffler, in which case the mechanical system for inlet or mechanical system for exhaust may be omitted.

Section 18. Fuel-Burning Appliances.

(a) Steam generators for tire vulcanizing, for oil and grease removal and for purposes other than space heating water heaters, and other fuel-burning appliances, such as forges, shall not be installed within bus operating section or within carpenter or paint shop.

Section 19. Inspection and Repair Pits and Trestles.

(a) Elevated trestles or hoists are preferable for this service. If pits

are used, they shall be continuously ventilated by a system independent of the main garage ventilating system. Such pits shall be cleaned at least daily and no accumulation of oil and grease permitted. Permanent illumination shall be provided.

"Five Suggested Methods of Appraising Insulation," by Paul D. Close, aroused no little discussion. One speaker made the comment that such a paper was only an attempt to justify materials which had a low heat-loss coefficient, while others made the criticism that the paper did not go far enough and include such factors as permanence. However, as Homer Linn remarked, the members were indebted to Mr. Close for bringing up a subject which aroused so much interest, and the majority of those present derived considerable benefit from the paper and the discussion.

In the report of the Nominating Committee, the following names were submitted: For president, L. A. Harding; for first vice-president, W. H. Carrier; for second vice-president, F. B. Rowley; for treasurer, Cecil W. Farrar; for members of the council, R. H. Carpenter, John D. Cassell, Alfred Kellogg, and John Howatt.

Director of Research Laboratory Comments on Progress

F. C. Houghten

THE celebration by THE HEATING AND VENTILATING MAGAZINE of the close of its first quarter-century of valuable service to the heating and ventilating engineering profession and industry leads one to reflect on the progress which we have made during that period and more particularly to reflect on the progress we are making at the present time.

We are all cognizant of progressive changes and improvement in heating and ventilating equipment and design as well as advancement in the solution of knotty problems presented by the skyward trend of modern buildings, and the demand for greater heat economy accompanied by a simultaneous demand for more perfect control of air conditions for human comfort and well being.

Many of us have been so engrossed in viewing this more material progress that we are prone to overlook an even more vital change in our standing as an important and independent branch of the engineering industry and profession. This change is best characterized by the crystallization of the technical data on which our engineering is based.

The best single indication of the advance we have made is seen in the development of the *Guide* of the American Society of Heating and Ventilating Engineers from the first edition in 1922, to the present volume. A comparison of the 1922 and the 1929 *Guide* gives a true picture of the progress made during these years.

In this progress can be seen the untiring work of the engineer in conference and committee, giving unselfishly the best of his efforts and technical information which he might have capitalized on as a personal advantage if he had been less altruistic. Through such effort, we have been standardizing, codifying and bringing into harmony a vast chaotic group of conflicting data with the result that today we can be said to be a branch of the engineering profession with a scientific background.

The result of the activities of the Research Laboratory of the American Society of Heating and Ventilating Engineers and the many university and private laboratories can be seen as a very vital factor in this progress.

—*F. C. Houghten.*

Stand of Steel Boiler Manufacturers on Boiler Rating

EDITOR HEATING AND VENTILATING:

We note your editorial in the July issue of HEATING AND VENTILATING, discussing the Boiler Rating Code, which is under consideration by the A.S.H.V.E.

To quote from this editorial, you state as follows: "The steel boiler manufacturers have gone on record as recommending that the published boiler ratings correspond to the 'estimated design load as defined in Section 5 of the A.S.H.V.E. Code of Minimum Requirements,' and that the published boiler ratings be determined by the amount of heating surface and grate area."

On the other hand, the recommendations submitted by the steel boiler manufacturers to the Rating Code Committee stated as follows: "The published boiler ratings shall correspond to the estimated designed load, as defined in Section 5 of the Code of Minimum Requirements, being the sum of items A, B, and C, Paragraph 1."

You will note that this statement of the steel boiler manufacturers specifically omitted "Item D," under Paragraph 1 of Section 5, which is known as the "starting-up factor." This omission is one of the most important features of the steel boiler manufacturers' report. It is one of the basic points of difference which they raised to the proposed rating code presented to the society at the 1929 summer meeting.

Raymond Newcomb,
Fitzgibbons Boiler Company, Inc.
New York

Paragraph 1 of Section 5 of the A.S.H.V.E. Code of Minimum Requirements reads as follows:

1. General: For the purpose of this code, the estimated connected load to the boiler or boilers stated in B.T.U. per hour to be installed shall be calculated by taking the sum of the following items:

(A) The estimated heat emission in B.T.U. per hour of the connected radiation (direct, indirect or both) to be installed, as previously determined by calculations from the data given by Sections 2 and 3 for normal operation.

(B) The estimated maximum heat in B.T.U. per hour required to supply water heaters or other apparatus to be connected to the boiler or boilers.

(C) The estimated heat emission in B.T.U. per hour of the piping connecting radiation and other apparatus with the boiler or boilers. Generally accepted values for the heat emission of bare and insulated pipe shall be employed in determining this item.

(D) The estimated increase in the normal load, in B.T.U. per hour, due to starting up cold radiation, etc.

This percentage of increase, to be based on the sum of items (A), (B), and (C), shall not be assumed less than the following:

(1) Sum of items, (A), (B), (C), in B.T.U. per hour:

B.T.U. per hour	
Up to 100,000	Add 65%
100,000 to 200,000	60
200,000 to 600,000	55
600,000 to 1,200,000	50
1,200,000 to 1,800,000	45
Above 1,800,000	40

Papers at National Fuels Meeting to Cover Domestic Use of Fuel

The domestic use of gas, oil, electricity, anthracite and bituminous coal and coke will be discussed at the Third National Fuels Meeting, to be held in Philadelphia, Pa., October 7-10, 1929.

Each of the different fuels has its advantages under certain conditions and the Philadelphia meeting will show where each is of the greatest advantage and how the home may be improved by the selection of the correct heating equipment for a given condition, and the proper regulation of the system, once it is installed.

B. T. U. Club

Every reader of HEATING AND VENTILATING, *whether a subscriber or not, is a member of this club. There are no initiation fees or dues. There is not even a constitution. The club functions as a forum or round table for the informal discussion by our readers, particularly the younger men in the industry, of topics in which they are interested, provided only that such topics pertain directly or indirectly to heating and ventilation. If you prefer, your name will not be used.*

Does This Settle the Question of Boiler Pressure?

MR. CHAIRMAN:

A series of three articles under the above title appeared in THE HEATING AND VENTILATING MAGAZINE for October and November, 1928, and February, 1929. The question, as put before the B.T.U. Club for solution was: "The owner of a steam heating system operating at 2.3 lbs. pressure, with returns coming back at a temperature of 212°, contemplated changing it so as to operate at 15.3 lbs. pressure with a return-water temperature of 242.9°, the radiation being varied in amount to maintain 70° in the rooms. Which system will require more fuel to operate? A.T.B."

The general opinion, expressed in the approved answers, was that the only sources of difference in the amount of fuel required to generate a quantity of steam which will deliver a fixed number of B.T.U. per hour at the two different pressures are the differences in the efficiency of steam generation and differences in the heat loss from the supply and return piping, due to the differences in steam temperature. Five of the correspondents estimated that the difference in fuel consumption caused by these variables would be from negligible to 5.8%.

The question, as stated, was excellent material for discussion and we are sure that it has helped many to a more correct understanding of the subject. However, we believe it probable that some may draw a conclusion from it which is wrong and which the author of the problem did not anticipate, namely, that under any condition, there is little difference in the fuel required to heat a building as a result of varying the pressure from 2.3 to 15.3 lbs. gauge—a difference of 13 lbs. and, for the same reasons, there can be no difference in the fuel required for heating the same building if the steam pressure were varied from atmospheric down to 12 lbs. below atmospheric or about 25 in. of vacuum.

If the heating season consisted of a series of days having a constant temperature, of say 40° F., with the same wind velocity and direction, the same humidity, the same hours of available sunshine, the same amount of cloudiness and all the other properties which make weather—if all these impossible assumptions were true—then a heating system might be designed to operate at a uniform steam pressure throughout that season, by using a sufficient amount of properly-designed radiation, properly located in the room, to give off a fixed number of B.T.U. per hour, with no difference in the cost of operation except as noted before.

In this hypothetical case we have made the same assumptions as in the problem: (1) The radiation shall be "varied in amount" to maintain 70° in the room, (2) the heat loss from the rooms, meaning the weather on the heating requirements, shall be the same, (3) and that the radiation considered is standard cast-iron.

Every one knows that heating seasons consist of days when the heating requirements vary from mild fall and spring weather, when very little heat is required, to severe winter days which tax the ability of any rationally-designed system to maintain 70° inside. Owing to the extreme and, at times, rapid natural variations in the heating requirements caused by these weather changes and because of the inherent demands of the building made during the heating-up period, etc., it is not possible to operate a heating system with a uniform steam pressure in the radiation throughout each operating hour of the season without either overheating or underheating most of the time. Such operation would result in tremendous heat waste through excessive window ventilation caused by overheating and other losses.

If one wishes to look at this problem as one in mathematics, take the formula for heat emission from a radiator, usually expressed as

$H = S \times K (t_s - t_a)$, where

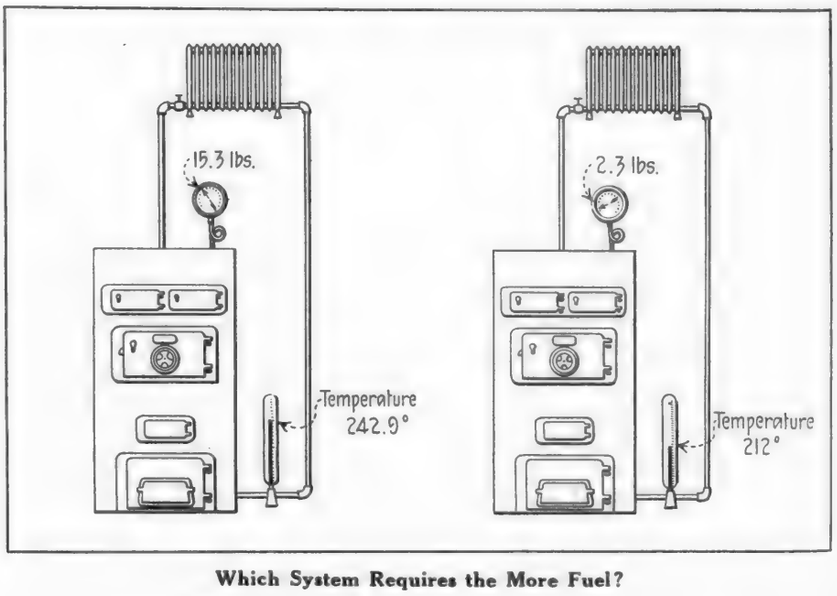
H = Total B.T.U. emitted per hour from a given radiator

S = Square feet of heating surface.

K = Coefficient of heat transmission in B.T.U. per square foot per hour per degree F. difference in steam and air temperature.

$(t_s - t_a)$ = Difference in temperature of steam and air of room.

It is evident that the physical size of the radiator cannot be altered from day



Which System Requires the More Fuel?

to day and that the air temperature should be uniform. Therefore, by varying the steam temperature it is easy to control heat emission "H." This can clearly be seen by referring to the formula above.

In calculating the variation in fuel consumption required, some of the correspondents went into the differences in the latent heat, heat of the liquid and specific volume of steam at the different pressures. These properties of steam simply are related to the question and are not direct causes of the transmission of heat which will be transmitted from steam to air of the room at the given temperatures. The latent heat of steam is the value which will determine how many pounds of steam must be condensed to release the required quantity of heat units; the heat of the liquid largely will determine the amount of heat which will be discharged from the radiator in each pound of condensate returned to the boiler; while the specific volume will determine the velocity of steam flow when these required B.T.U. are delivered through a pipe of a certain size.

Temperature of Major Importance in This Problem

To make the matter more clear, we will say that qualities or characteristics, intensity of temperature and quantity or amount of heat units contained in the object considered. Heat can be transferred from one object to another only when there is a difference in temperature between the two. The only property of steam which can cause heat to "flow" through a radiator surface is the intensity of the heat in the steam, as compared to the intensity of the heat in the air, or the $(t_s - t_a)$ of the equation. In considering heat transfer, the other properties of steam are secondary.

The evidence against operating high-pressure heating plants, when so operated chiefly for heating purposes, is very conclusive. A. L. Sanford, mechanical engineer for the Minneapolis School Board, presented an excellent paper before the National Association of Public School Officials entitled "Operating Data on Low-Pressure Heating in Minneapolis Schools." This paper is printed in the Journal of the A.S.H.V.E. for September, 1926. (See also THE HEATING AND VENTILATING MAGAZINE for July and August, 1926, Pages 76 and 65, respectively.) The author gives data on the comparative cost of fuel and electric power used per cubic foot of building contents for high and low-pressure plants.

A high-pressure plant is defined as one operating on a boiler pressure from 15–150 lbs. gauge, using steam-driven power equipment, and utilizing the exhaust steam at a pressure from 2–5 lbs. for heating purposes, supplemented with steam direct from the boiler reduced to 5 lbs. in severe weather.

Low-Pressure Plants Operated More Cheaply Than High-Pressure Plants

A low-pressure plant is defined as one operating on 10 lbs. gauge boiler pressure or lower and supplying steam at 2–5 lbs. to the heating system. The last high-pressure system built for Minneapolis schools was in 1913. Since then (to 1926) all new plants erected have been low-pressure, with motor-driven pumps, fans, etc. The data averaged over several years show that the operating cost of both fuel and power was reduced between 3.6% and 45.4% as a result of operating at low-pressure and purchasing electricity for power.

This report shows the general trend of heating practice in the United States, for the past three decades, toward reducing the pressure of the steam supplied to the radiation to the lowest absolute pressure (or steam temperature) which will maintain uniform room temperatures. When the pressure and temperature of the steam supplied to the radiation is so controlled that the rate of heat emission from the heating surface is just equal to the rate of heat loss from the building, the room temperature will be held uniform, eliminating overheating and its accompanying heat waste.

Let us return to our earlier statement that the radiation must be sufficient, of proper design and properly located in the room. The original question said ".....", the radiation being varied in amount to maintain 70° in the rooms." The standard interpretation of the temperature is that the room temperature shall be determined 5 ft. above the floor and not less than 3 ft. from an exterior wall. The "amount" may be varied theoretically by varying the length, number of tubes, height and other physical characteristics of the radiation.

It may appear that this part of the discussion is not admissible under the statement of the problem. However, it has been proved that two radiators of different heights, located in identical test rooms can maintain the same temperature at the breathing line and give large differences between the floor and ceiling temperatures, the taller radiator condensing much more steam than the low one. It follows that the radiator design must carefully be selected to avoid the heat waste due to overheated ceilings.

The increase of the steam or radiator surface temperature will increase the rate at which heat is dissipated from a given surface to the objects in a room. That same surface temperature increase also will increase the temperature of the air leaving the radiator and the velocity at which it flows over the radiator, assuming the air movement to be only that set up by natural connection currents.

Therefore, the selection of two radiators which will give identical heating effects at floor, breathing line and ceiling, with the same amount of B.T.U. per hour at 2.3 and 15.3 lbs. pressure will be a very complicated problem.

A study of the practical side of the problem of satisfactory and economical heating, under variable weather conditions, leads to the following conclusions:

First, the radiation and piping should properly be selected so that the building can uniformly be heated at the base design pressure and temperature.

Second, the control of the system should be such that the operator, or automatic equipment, quickly and easily can regulate the absolute steam pressure which determines the rate of heat emission from the radiators and thus the room temperatures. This absolute steam would vary from, say, 2 or 3 lbs. up to perhaps 17 lbs. The corresponding steam temperatures would be ranging from about 130° to 220° F. In very mild weather the radiation may only partially be filled with steam at low absolute pressure, making further reduction in heat emission of each radiator.

If this rate of heat delivery to the building is equal to the rate of heat loss, the object, satisfactory and economical heating, has been accomplished.

T. D. FARNSWORTH

Chicago, Ill.

H. & P. C. N. A. Standard Welding Neck Flanges

One of the important accomplishments of the Sub-Committee on Welding of the H. & P. C. N. A., as reported at the association's recent annual convention in St. Louis, was the design and acceptance of standard welding flanges. It is being made in three types, Series 15 with standard dimensions, Series 30 with extra-heavy dimensions for extra heavy pipe, and Series 30 with extra-heavy dimensions for standard pipe. The first two of these standards are presented as this month's data sheets on Page 100-A.

These new flanges are now a national standard, and are being manufactured on a competitive basis. Heretofore, the welding flanges available, states the committee, have been either unsatisfactory in design or have been offered at a prohibitive cost.

New York City Adopts Certified Heating

William E. Taylor
Executive Secretary, H. & P.C.
New York City Association

Robert B. Miller
President, Heating and Piping Contractors
New York City Association

M. E. Durkee
Manager, Certified Heating Bureau, H. & P.C.
New York City Association

CERTIFIED Heating for residences up to and including six stories in height, and for business buildings up to and including 10 stories in height, has been adopted by the Heating and Piping Contractors New York City Association, according to an announcement issued under date of July 6 by William E. Taylor, executive secretary of the association. The headquarters of the association are at 50 Union Square, East, New York. This action brings up the number of cities operating on the Certified Heating plan to 30. The other cities are: Chicago, Cincinnati, Cleveland, Oakland, Calif.; Boston, Buffalo, Detroit, Fox River Valley, Wis.; Greensboro, N. C.; Kansas City, Mo.; Los Angeles, Memphis, Milwaukee, Newark, Houston, Texas; La Crosse, Wis.; Louisville, Madison, Wis.; Minneapolis, Norfolk, Va.; Philadelphia, Portland, Ore.; Richmond, San Francisco, Seattle, Sheboygan, Wis., St. Louis, Utica and Washington, D. C.

As is well known, the plan is founded upon the code of "Heating Standards" built up by the Heating and Piping Contractors National Association and will be made available to the public of the New York district on and after August 1, 1929, through the heating contractors who hold membership in the Heating and Piping Contractors New York City Association.

In accordance with the plan, every contractor member of the New York City association must submit his plans for a proposed installation to association headquarters before he proceeds with the work, to have it checked against the association's standards to see that boiler, radiator surface and pipe sizes correspond with those standards. In addition, the work will be inspected by the association during its progress to make sure that the contractor carries out the approved plan. Not only will the work be checked and inspected, but in addition, a certificate will be issued to the owner and the work itself will be so marked to establish the fact that the New York City association, as a group, accepts responsibility for the adequacy of the heating systems.

In common with other progressive elements in the heating industry, this association has recognized the fact that the ills of the industry were caused by no one group, but rather that each group contributed its share of the sum of bad practices and to correct the situation must in turn do its share in cleaning its own house.

As the representative of the best in heating contracting, the New York City association has inaugurated two other important steps in association activity which will be far reaching in their beneficial effects within the industry.

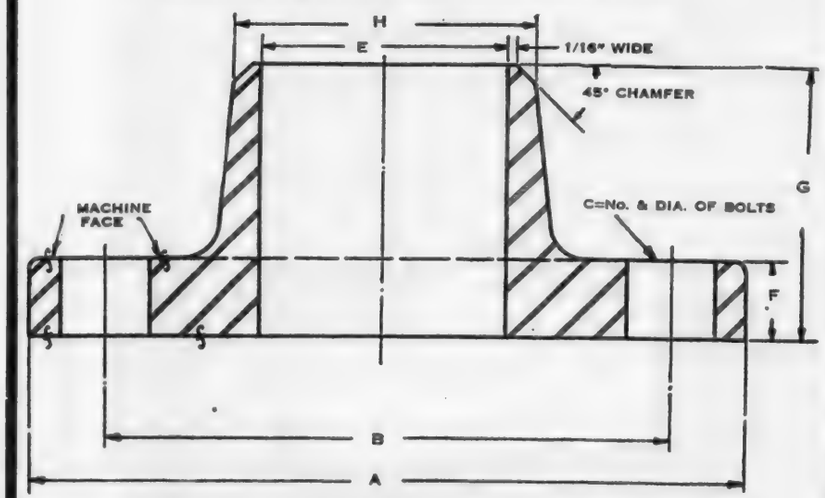
The first step was the organization and operation within the association of a "Quantity Survey Bureau" for the purpose of providing the contractors with uniform interpretation of specifications and list of material required to meet the specified requirements. This activity has nothing whatever to do with prices in any form; it deals only in quantity and type of materials so that the contractor knows exactly what is required and can price the work intelligently. The process of taking off material in this way reduces the chance of error of either too much or too little material figured upon and eliminates to a very large extent the duplication of effort and its expense, where each of the contractors figuring a job, do exactly the same thing.

With the "Quantity Survey Bureau" the cost of giving the quantities is billed to the contractor and charged on his estimate sheet as an item of direct cost the same as any material required. Each contractor is charging the owner for the cost of estimating his work only and the successful contractor pays the bill to the association.

The next step was the adoption of the "Code of Standards," created by the Heating and Piping Contractors National Association. These standards are the result of many years of research work by the national association and refer to boiler sizes, pipe sizes and radiator sizes, which have proven to be adequate in all sections of the country so that, where these standards are used, the heating plant will perform its function adequately.

STANDARDS OF
HEATING AND PIPING CONTRACTORS NATIONAL ASSOCIATION
COMMITTEE ON STANDARDIZATION
SUB-COMMITTEE ON WELDING
STANDARD WEIGHT WELDING NECK FLANGES FOR STANDARD PIPE
Series 15

Copyrighted, 1929, by Heating and Piping Contractors National Association



Size	A	Drilling		E	F	G	H
		B	C	Standard Pipe			
2	6	4¾	4– ⅝	2⅛	⅝	2½	2½
2½	7	5½	4– ⅝	2⁹⁄₃₂	11⁄16	2¾	3
3	7½	6	4– ⅝	3⅛	¾	2¾	3⅝
4	9	7½	8– ⅝	4½	15⁄16	3	4⅝
5	10	8½	8– ¾	5⅛	15⁄16	3½	5¹¹⁄₁₆
6	11	9½	8– ¾	6⅛	1	3½	6¾
8	13½	11¾	8– ¾	8	1⅛	4	8¾
10	16	14¼	12– ⅞	10	1⅜	4	10⅞
12	19	17	12– ⅞	12	1¼	4½	12⅞
14 O.D.	21	18¾	12–1	*	1⅜	5	14⅜
16 O.D.	23½	21¼	16–1	*	1⅜	5	16¼
18 O.D.	25	22¾	16–1⅛	*	1⅜	5½	18¼

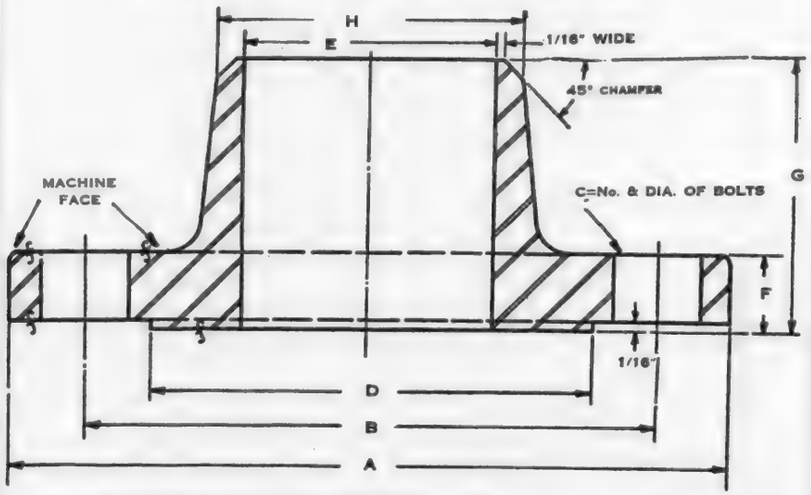
* Orders or inquiries should specify diameter of bore "E" required.

(Continued on Data Sheet No. 14-A)

(Continued from Data Sheet No. 14)

STANDARDS OF
HEATING AND PIPING CONTRACTORS NATIONAL ASSOCIATION
COMMITTEE ON STANDARDIZATION
SUB-COMMITTEE ON WELDING
EXTRA HEAVY WELDING NECK FLANGES FOR EXTRA HEAVY PIPE
Series 30

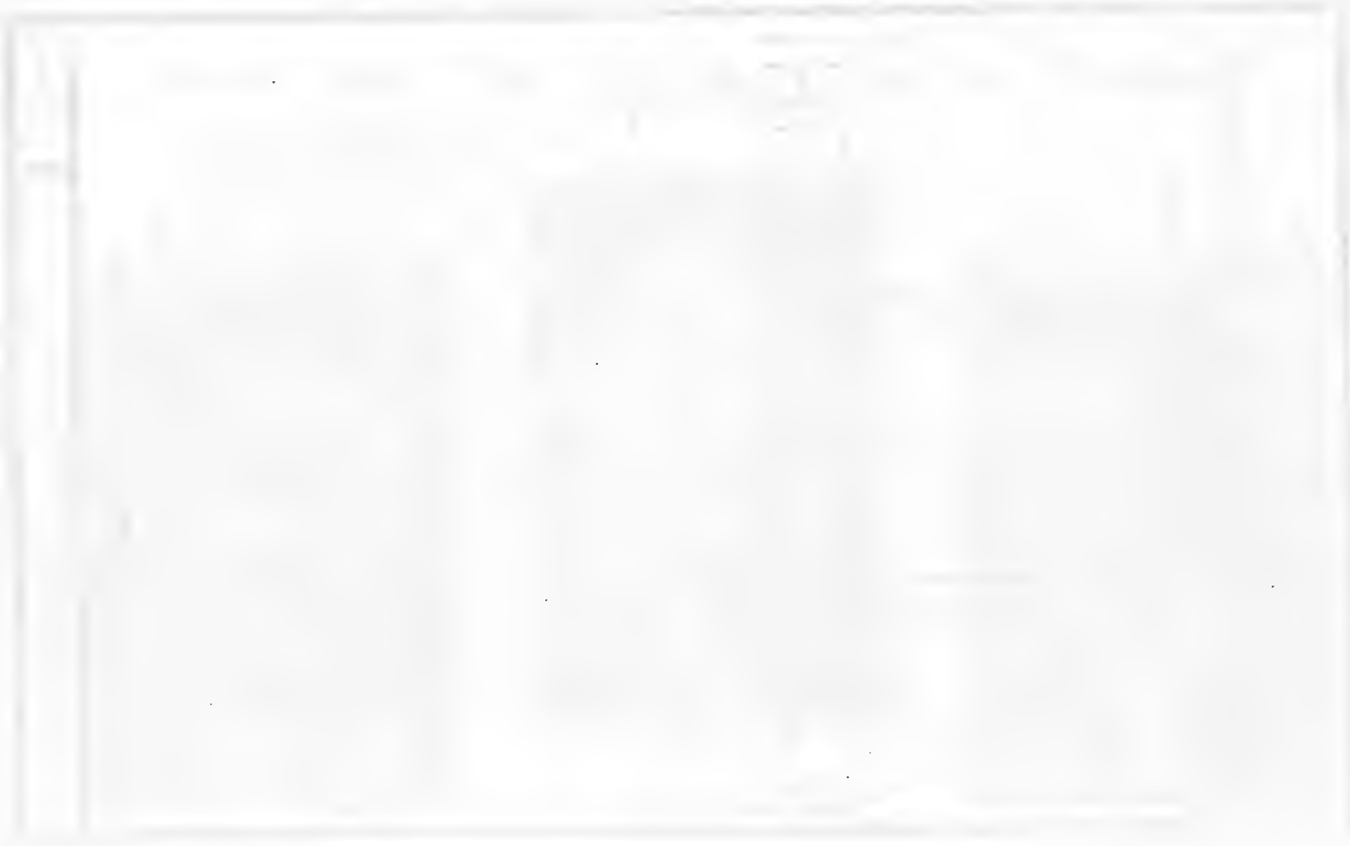
Copyrighted, 1929, by Heating and Piping Contractors National Association

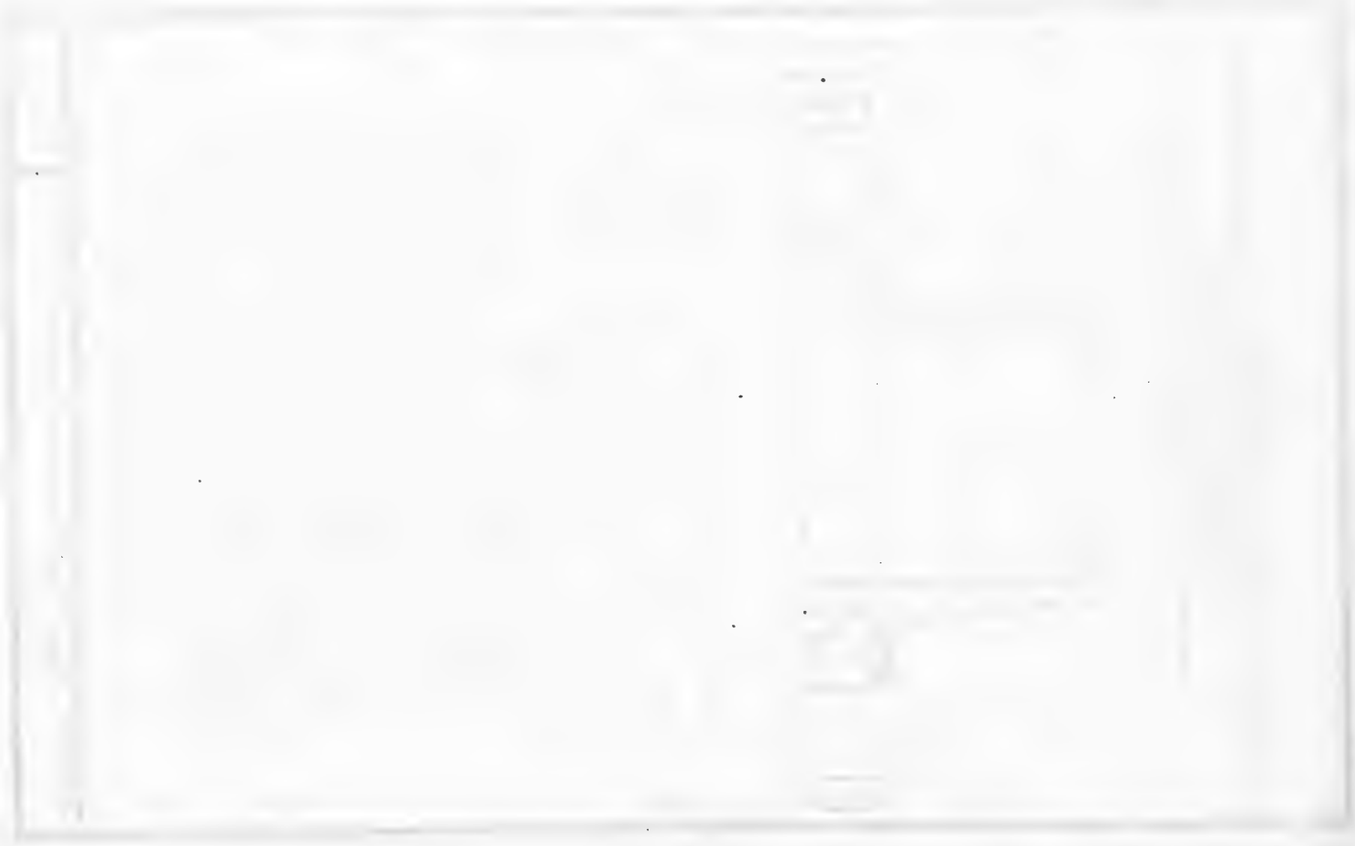


Size	A	Drilling		D	E*	F	G	H
		B	C		Ex. Hvy. Pipe			
2	6½	5	8– ⅝	3⅝	1¹⁵⁄₁₆	⅞	2¾	2½
2½	7½	5⅞	8– ¾	4⅛	2⅛	1	3⅛	3
3	8¼	6⅝	8– ¾	5	2⅞	1⅛	3⅛	3⅝
4	10	7⅞	8– ¾	6⅛	3¹³⁄₁₆	1¼	3⅜	4⅝
5	11	9¼	8– ¾	7⅝	4¹³⁄₁₆	1⅜	3⅞	5¹¹⁄₁₆
6	12½	10⅝	12– ¾	8½	5¾	1⅜	3⅞	6¾
8	15	13	12– ⅞	10⅝	7⅝	1⅝	4⅝	8¾
10	17½	15¼	16–1	12¾	9¾	1⅞	4⅝	10⅞
12	20½	17¾	16–1⅛	15	11¾	2	5⅛	12⅞
14 O.D.	23	20¼	20–1⅛	16¼	*	2⅛	5¾	14⅜
16 O.D.	25½	22½	20–1¼	18½	*	2¼	5¾	16¼
18 O.D.	28	24¾	24–1¼	21	*	2⅜	6¼	18¼

* Orders or inquiries should specify diameter of bore "E" required.

(Concluded on Data Sheet No. 14-B)





Chicago Chosen for 1930 A. O. B. A. Convention

At the regular quarterly meeting of the board of directors of the American Oil Burner Association, held in Erie, Pa., July 10, Chicago was chosen for the 1930 convention. The selection of exposition headquarters was left in the hands of the executive committee. It was also decided that the show would be held for a period of one week, instead of three days and that plans would be made to attract public interest and attendance.

President Fleischmann outlined the association policy for the balance of the year and proposed that the association foster greater activity in technical and market research. He further proposed that, together with the Oil Heating Institute, the association organize a speakers' bureau to cooperate with various national and sectional groups of the heating industry, engineering societies, luncheon clubs, etc., to provide speakers who will address their meetings on subjects pertinent to the oil burner industry.

John H. McIlvaine was elected to the board to fill the vacancy caused by the resignation of Edward Blake.

Semi-Rigid Insulation Is Easy to Install

IN addition to the types of building insulation illustrated in the article by H. S. Ashenhurst, in the Silver Anniversary Issue of Heating and Ventilating, the semi-rigid form has many advantages, particularly with regard to ease of installation, as illustrated in the accompanying photographs.

This particular type is cut and flanged and delivered on the job ready to slip between the standard studs with 16-in. centers. It is not pushed against the sheathing but simply fitted in until the edges of the flanges are flushed with the stud facings. This is the principle of the now much-discussed "two-air-space" application. The material forms a wall within a wall, creating two air spaces and adding about 50% to the resistance to heat.

A Tight Fit is Assured by Nailing the Flanges of the Insulation to the Stud Facings

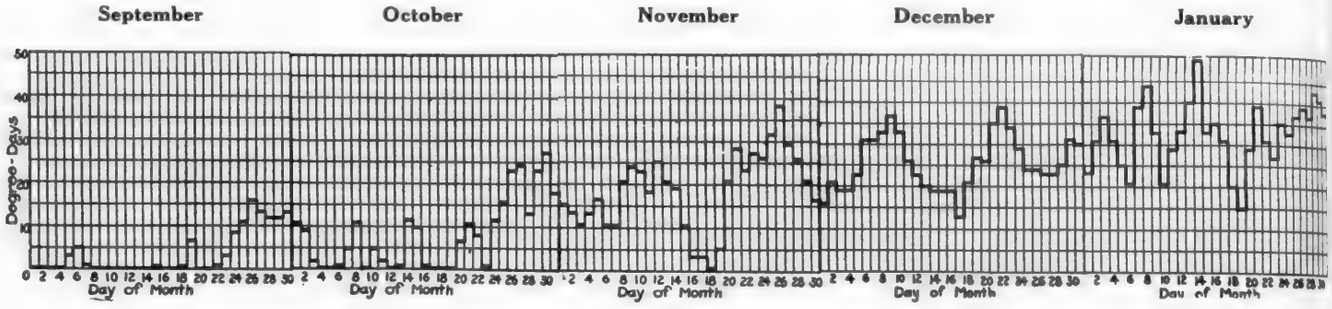
Typical Application of Semi-Rigid Insulation to a Home

Heating Season of 1928-29

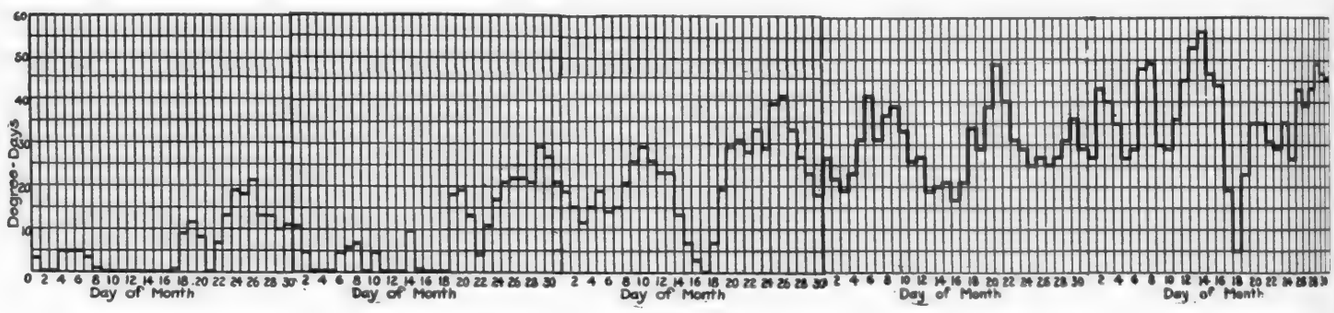
ON accompanying pages are shown degree-day charts for the nine typical cities for the heating season of 1928-29. These were made by cutting out and pasting together the charts as published in HEATING AND VENTILATING each month during the heating season. They clearly bring out the distribution of heating load over the different months.

Totals for the cities for the year, and also for the 50-year average as published in the Iso-Degree-Day Chart in THE HEATING AND VENTILATING MAGAZINE, for September, 1925, are presented in the following table:

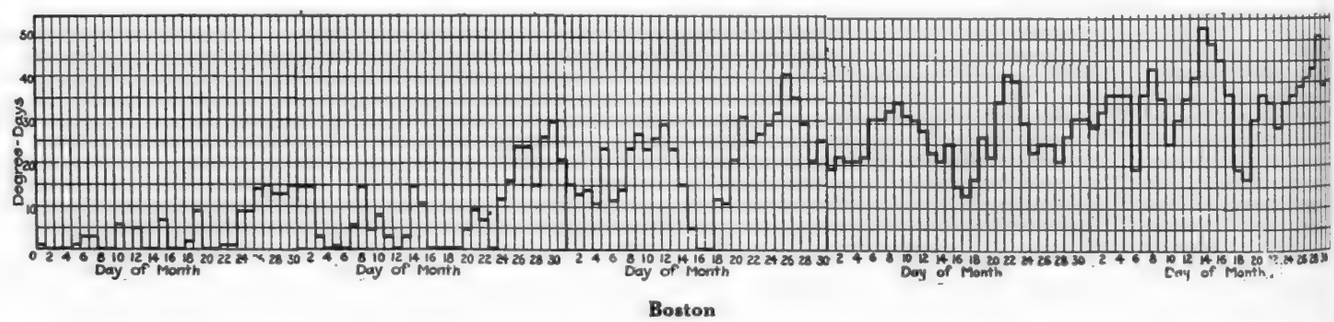
City	Degree Days Season 1928-29	Degree Days Average Season
Boston	5407	6055
New York	4930	5303
San Francisco....	3216	3450
Pittsburgh	5434	5327
Chicago	6431	6007
St. Louis	4703	4583
Minneapolis	8139	7953
Denver	6416	5880
Seattle	5505	5156



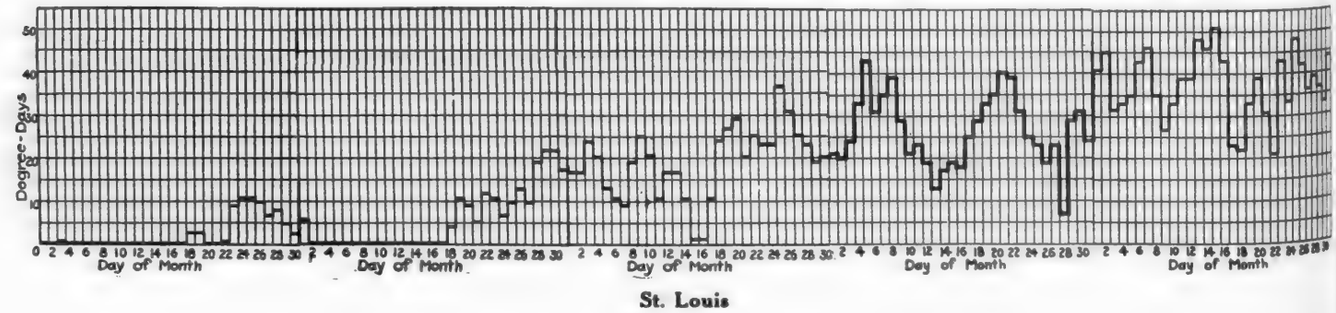
New York



Pittsburgh



Boston

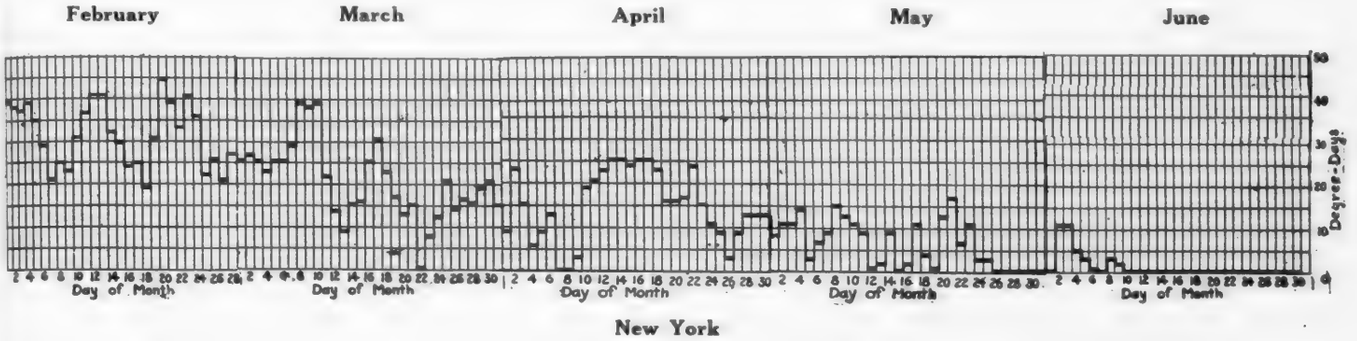


St. Louis

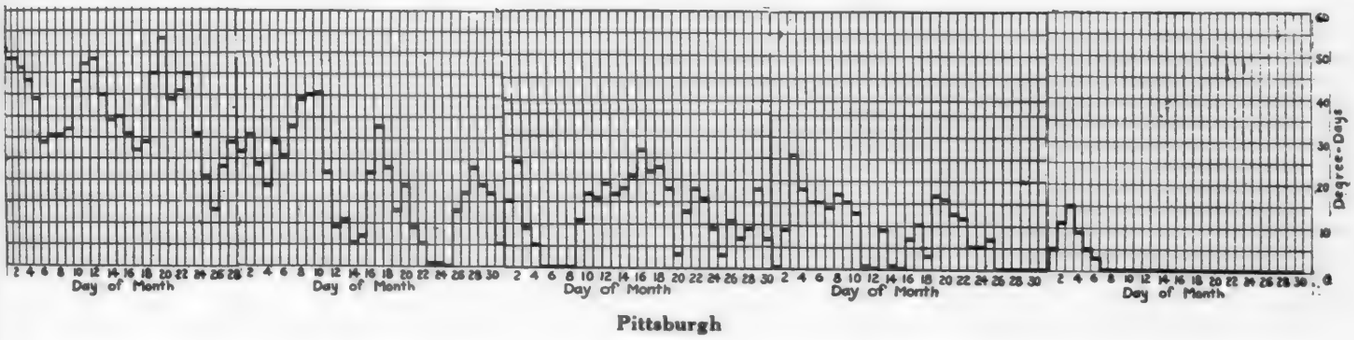
More Severe Than Average

While three cities, Boston, New York, and San Francisco, show a total for the season lower than the average year, the other six cities experienced a more severe winter so far as heating load is concerned. Boston had the greatest deviation from normal, with a decrease of 648 degree days, while Denver shows an increase for the season of 536 degree days. The per cent variation was 10.7% and 9.1%, respectively.

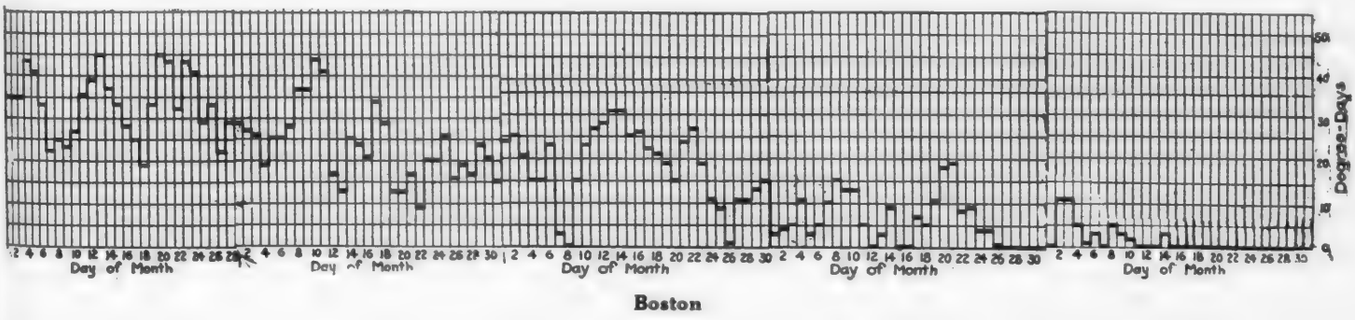
Such variations from normal account for fuel consumption above estimated amounts, and will enable the gas house-heating engineer, oil-burner sales engineer or domestic stoker engineer to explain satisfactorily to his customers the reasons for higher fuel costs. If installations are calculated correctly and local conditions taken into consideration, the variation in fuel consumption from season to season will be in direct proportion to the deviation from normal degree-day totals.



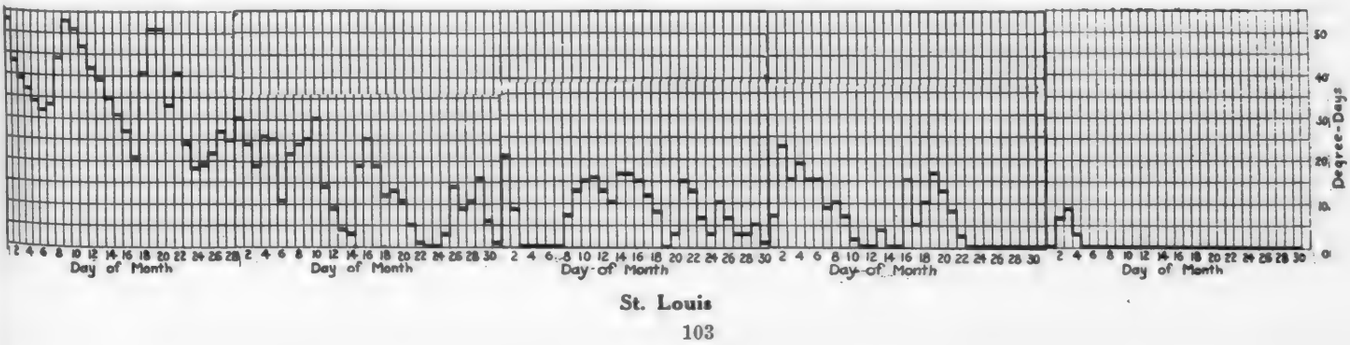
New York



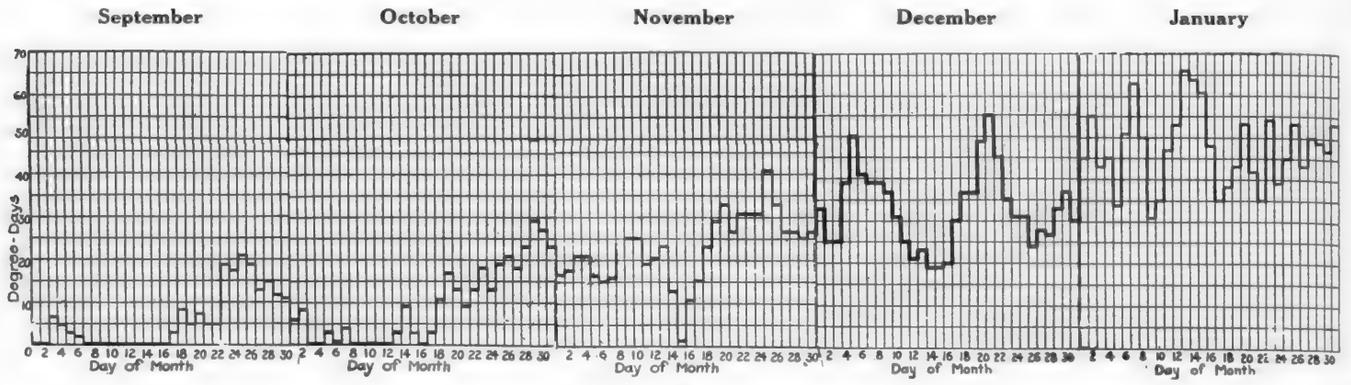
Pittsburgh



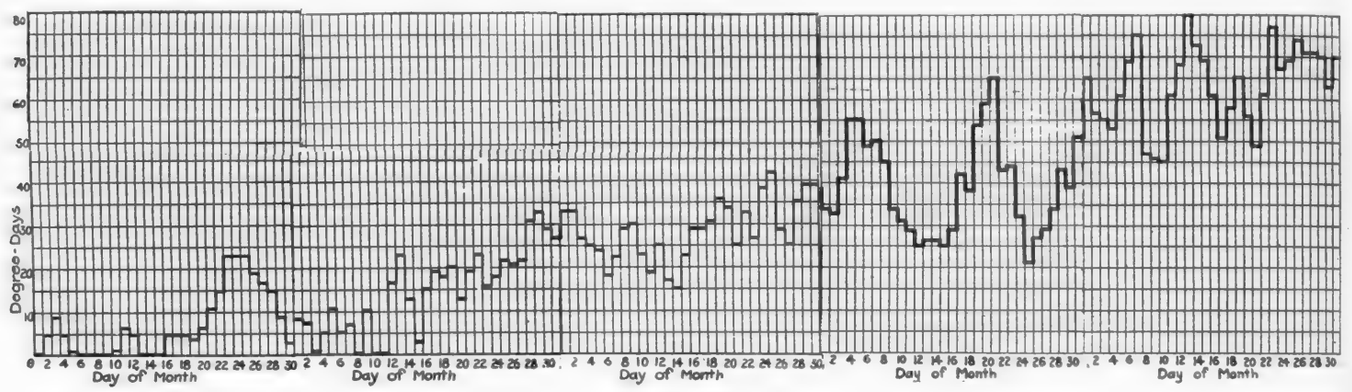
Boston



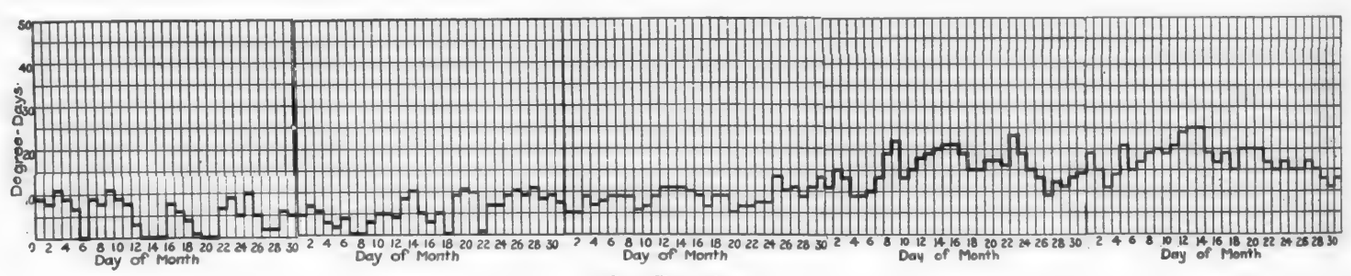
St. Louis



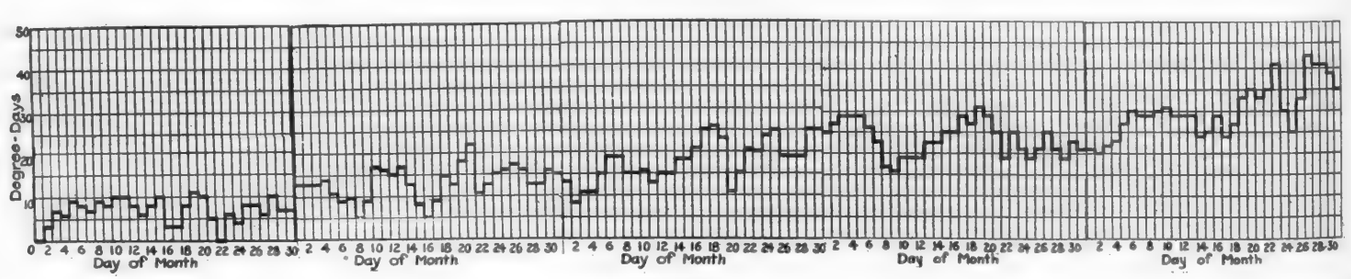
Chicago



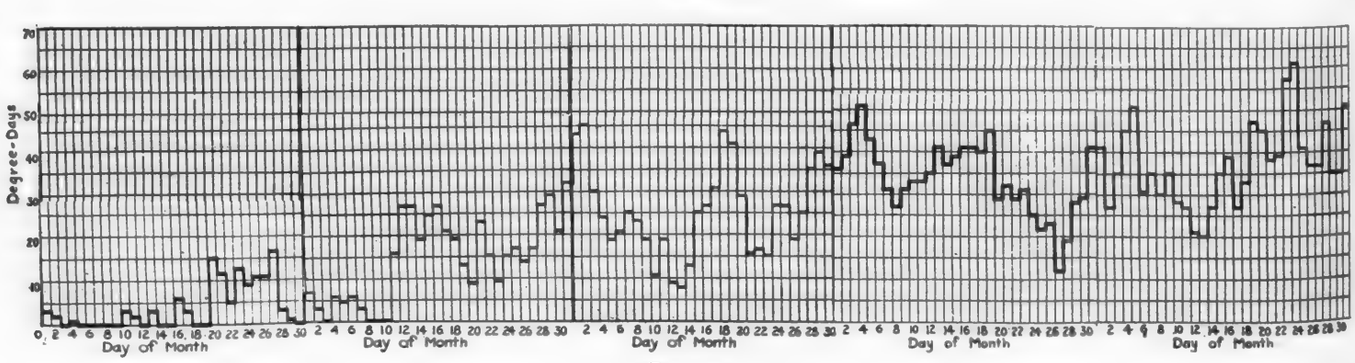
Minneapolis



San Francisco

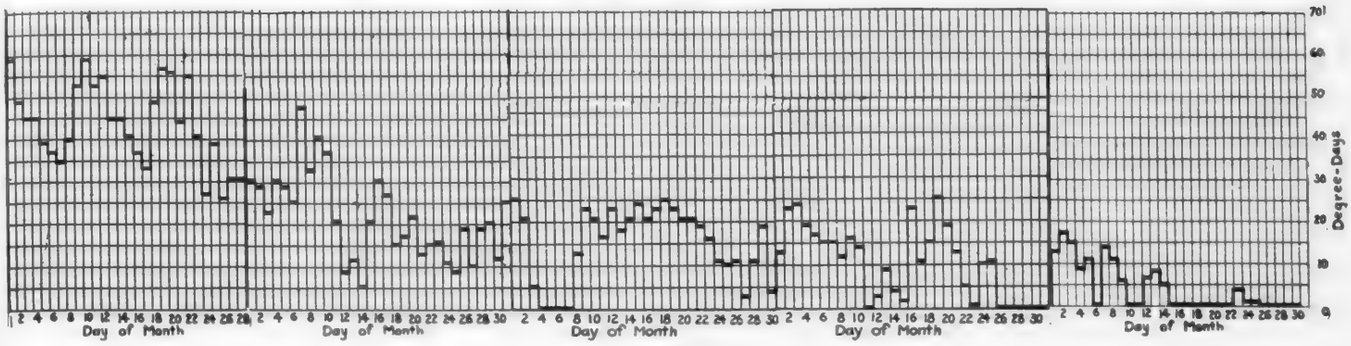


Seattle

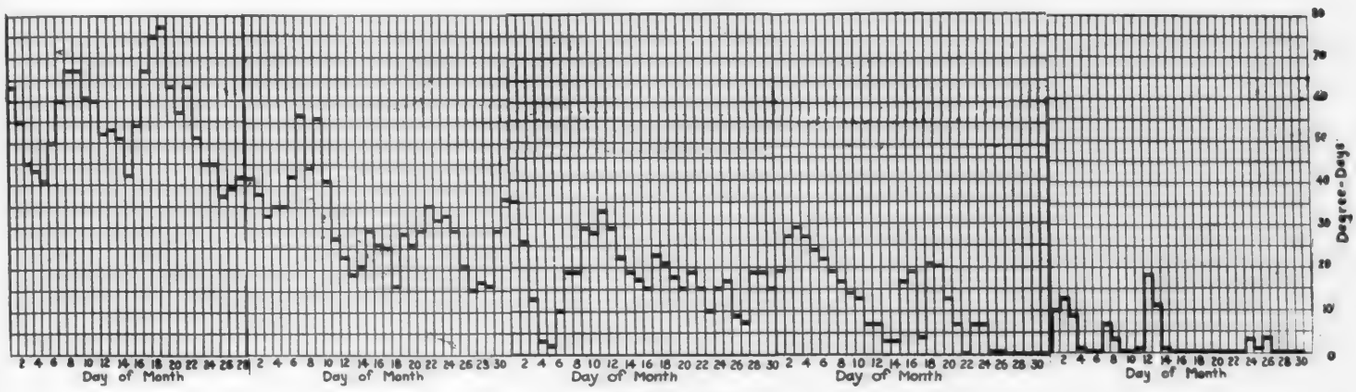


Denver

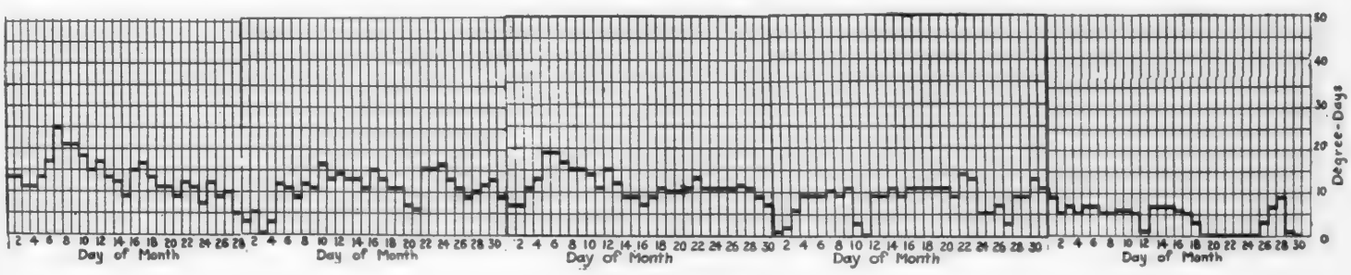
February March April May June



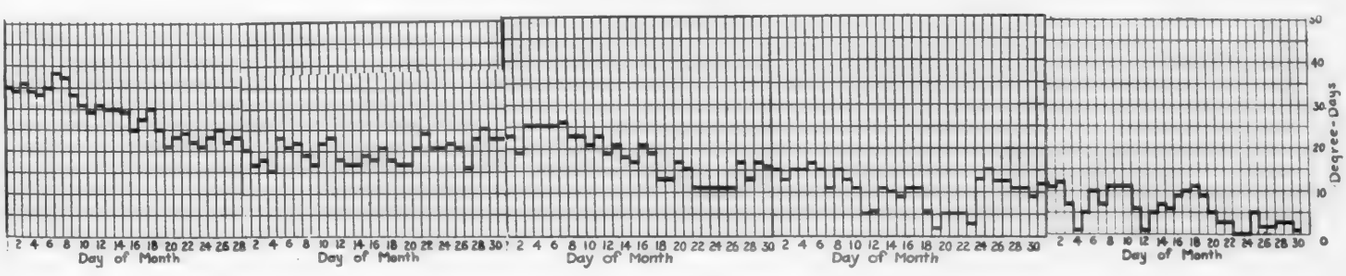
Chicago



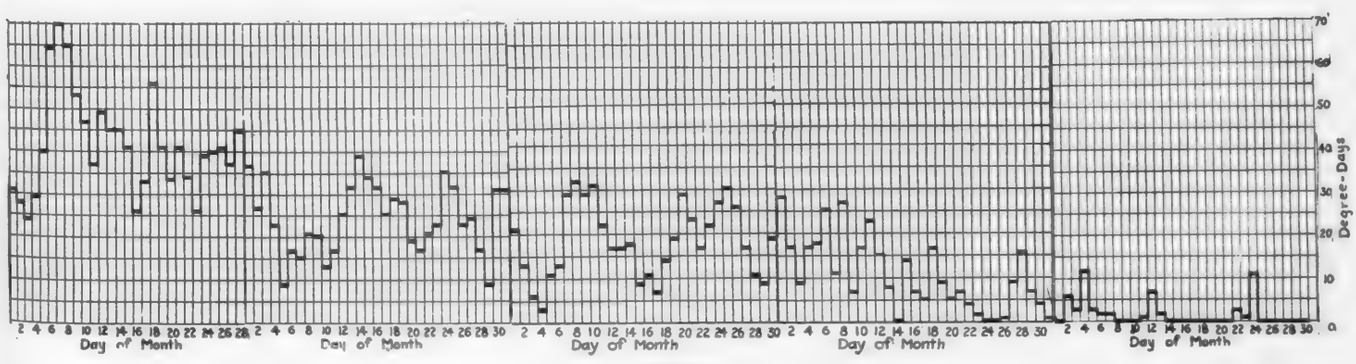
Minneapolis



San Francisco



Seattle

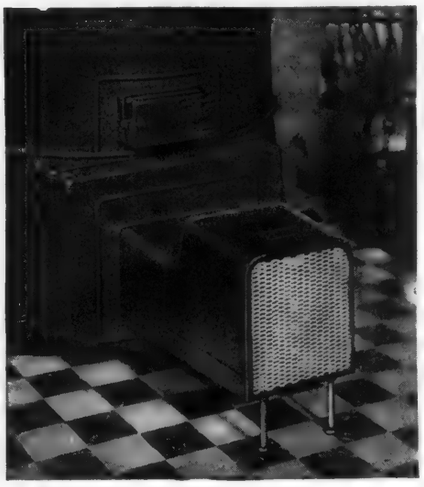


Denver

New Apparatus and Appliances

Kleen-Heet Challenger Burner Placed on Market

Under the title of "Kleen-Heet's Biggest News to Date to the Oil Burner Industry" the Winslow Boiler & Engineering Co., Chicago, Ill., announces its improved Kleen-Heet Challenger burner. The announcement takes the form of a number of folders directed to the company's dealer organization and includes an interesting appraisal of the new model by George Ade. As examples of



New Kleen-Heet Challenger

artistic compilation and press work, the folder is outstanding among recently issued publicity material.

Among the features of the new burner, which is of the noiseless gravity-feed type, is an air meter, located at the front of the burner, which takes care both of the balance damper and of the draft-gauge setting. The function of this meter is similar to that of an electric meter and serves to measure and gauge the amount of air that should go into the burner for proper combustion.

Oil is fed by gravity to the burner. The strainer is integral with the control unit. Included in the controls are standard Minneapolis-Honeywell thermostat and pilot relay, Kleen-Heet bimetallic switch, solenoid valve, float valve, float switch and oil-regulating needle valve. The ignition is by gas with special flow orifice. The Challenger is designed for a capacity of from 425 to 1000 sq. ft. of water radiation. It is furnished in moss green, Duco finish and black and ivory trim.

Based on typical costs for this burner with a 270-gal. tank, direct connected, the selling price is $370 cash, or $399 on a deferred-payment plan.

Multicell Unit Heater

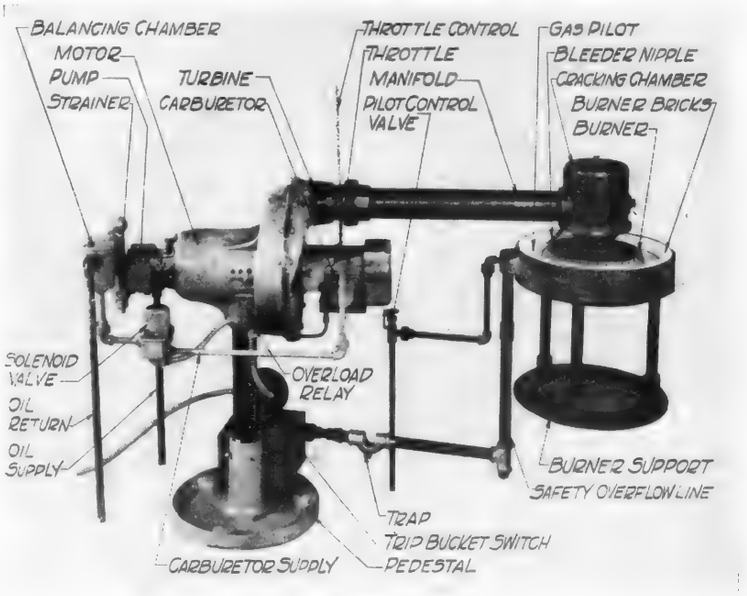
One-piece seamless copper sections, in which solder is not used, make up the heating surface of the unit heater announced by the Multicell Radiator Corp., 80 Terrace St., Buffalo, N. Y. Each section takes up its own expansion and contraction on a principle similar to an accordion. Two unions connect each section, there being no slip joints or diaphragms.

Sections are made by the electrical deposition of copper, so that sections of uniform thickness are obtained. The heaters are made in numerous sizes, ranging from 13 in. x 13 in. face area to 30 in. x 30 in. face area. Capacities are from 40,000 B.T.U. per hr. to 200,000 B.T.U. per hr.

Crystal Oil Burner

The Crystal Blue Flame oil burner is being marketed by the Crystal Oil Burner Corp., 1440 Broadway, New York. When the required heat in the room is reached, the thermostat controls an automatic throttling device so that the supply of oil and air is cut down until the oil consumption is reduced 50%. The burner is installed above the grate in the fire chamber and rests on an adjustable pedestal, which is supported by the grate.

A gas pilot ignition is used and is equipped with an automatic device that shuts off both oil and motor if the ignition fails. The burner is made in four standard sizes, the capacities ranging from 350 to 5000 sq. ft. of steam radiation.



Crystal Blue Flame Burner

Cutaway View of Thermoist Unit

Thermoist Unit

Thermoist Unit, a concealed heater with automatic humidity supply, is announced by Frank E. Woodward Co., 19 Friend St., Boston, Mass. A sub-floor device, it is installed below first-floor rooms and only a small, flush grille is visible in the room. Heating is accomplished by an extended-surface radiator of brass with brass radiating fins. Automatic regulation of humidity is provided for by a copper pan which contains an air-moistening device.

Supplied automatically through a float valve connection to the water mains, this pan is kept filled with water to a proper depth. The brass radiator return is piped through the pan, thus heating the water. As the heating effect of this pipe varies, consequently the humidity can be increased or decreased by varying the depth of water in the pan. A damper controlled from the floor grille regulates the heat supply to the room. Four sizes are furnished in capacities ranging from 30 to 95 sq. ft. of equivalent direct radiation.

THE STATE BANK BUILDING, CHICAGO, ILL.
Architects & Engineers: GRAHAM, ANDERSON, PROBST & WHITE
Heating Contractor: PHILLIPS GETSCHOW CO.

The Powers Vapor Disc Thermostat
Often gives 15 to 20 years of accurate control without repairs of any kind

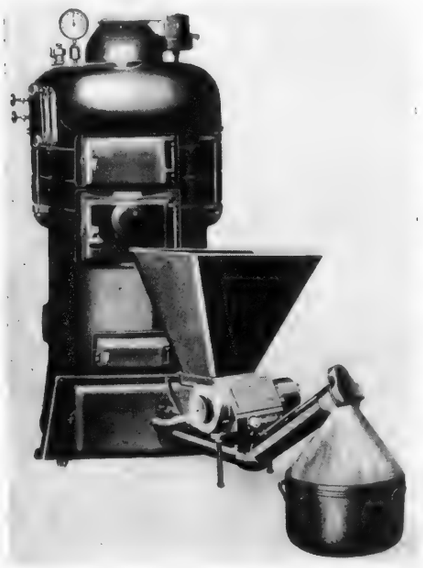
Prompt and Unfailing SERVICE During Life of Building

In selecting the Powers System of Temperature Regulation for the banking quarters, and Powers Riser Control to regulate the steam supplied to various parts of the above building, the Architects and Engineers have provided their client with the strongest guarantee of *dependable service* money can buy.

Powers Control usually costs more; it's worth more! because, of its long service without repairs and the frequent inspections we make to insure exact control at all times. This SERVICE continues throughout the life of the building and the user gets the largest possible return on his investment in heat control.

THE POWERS REGULATOR COMPANY
35 Years of Specialization in Automatic Temperature Control
CHICAGO: 2718 Greenview Avenue ∽ Offices in 35 Other Cities ∽ NEW YORK: 137 East 46th Street
The Canadian Powers Regulator Co., Ltd., Toronto, Canada

POWERS



Uniflow Stoker for House-Heating Plants

Uniflow Automatic Furnace Tender

A domestic stoker with unusual features has been brought out by the Uniflow Stoker Co., Sydney, O., under the name of the Uniflow automatic furnace tender. It is designed to control the combustion of coal in a warm-air furnace. The device operates automatically to feed the coal to the furnace by the underfeed method, to shake the grate and to remove the ashes.

A thermostatically-controlled ¼-H.P. motor operates the machine. The coal hopper holds a maximum of 400 lbs. Ashes are sifted, conveyed and dumped into a public container, which is of sufficient size to hold a week's accumulation. Fluted cast-iron crusher rolls are applied to crush any lump of coal too large for the feed worm, while a shearing pin safety device on the gear box is provided to protect the gear against non-crushable foreign matter.

Steam Turbine for Unit Heaters

A small steam turbine for use with unit heaters has been brought out by the Murray Iron Works Co., Burlington, Iowa. The turbine exhausts steam to the heating coils and the power thus is obtained at a minimum cost.

About two-thirds of the steam required for the heating element is consumed by the turbine and the remaining one-third is by-passed through the turbine by means of a valve provided for that purpose. A separate speed control valve is part of the equipment.

Some of the largest installations of this type have been made for eastern railroads, involving, in some cases, from 20 to 100 turbines for each installation.

Texrope Drive

A drive designed to eliminate the humming and roaring common to machinery used for driving ventilating and cooling equipment is being marketed by the Allis-Chalmers Mfg. Co., Milwaukee, Wis. This drive, known as the Texrope, consists of multiple V-shaped belts composed of rubber impregnated cotton cords, the fabric base of which absorbs vibration and noises.

The wedging action of the V-shaped belts gives positive transmission of power without slippage or the necessity of excessive belt tension. A feature of Texrope drive is its flexibility, which permits its use when the motor sheave and fan sheave are short center distances apart. These drives can quickly be installed on present equipment.

Mine Fan Installation with Texrope Drive

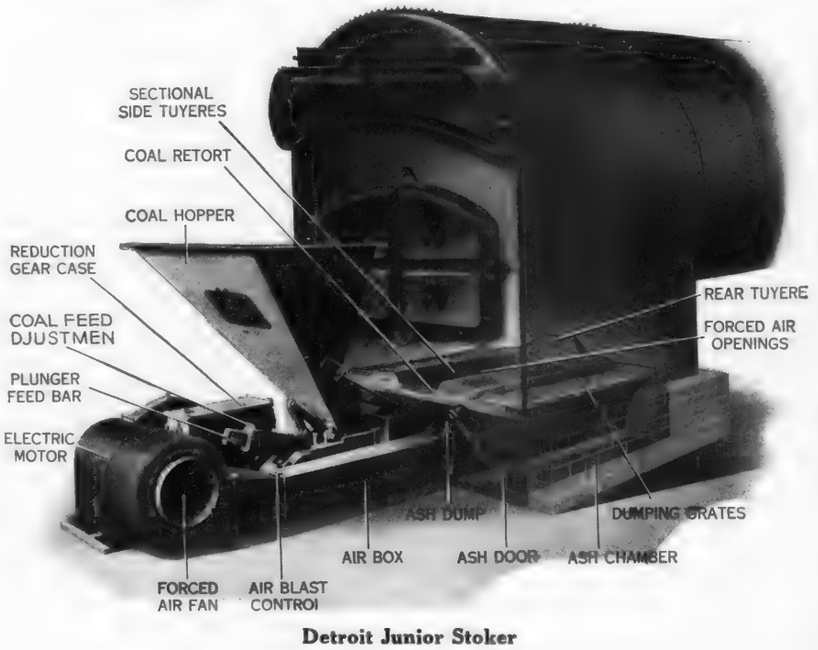
Detroit Junior Stoker

A Junior stoker has been announced by the Detroit Stoker Co., Detroit, Mich. The unit operates with electrically operated fan and mechanical drive, plunger feed, controlled fuel distribution and balanced dumping grates. The plunger feed system eliminates stoppages due to obstructions and wet coal. Distribution of coal within the boiler is controlled by an adjustment of the stroke of the pusher bar, thus maintaining the proper thickness of fuel bed. Air is distributed at predetermined pressure to all parts of the furnace, as a result of which the coal is burned efficiently.

An important feature of the stoker is the side cleaning arrangement. Balanced dump plates are provided. Before dumping, a small blast gate is opened between the air chamber and the ashpit, allowing air to be admitted through the perforated dump plates for complete combustion of the combustible in the ash. By turning the dump lever, the ashes are deposited in the pit, where they are cooled before removal.

Pressure or temperature control is available when required to meet the needs of the individual installation. The driving motor, fan and fuel plunger system are combined in one unit and draft is automatically regulated in proportion to the fuel burned, making possible the close control of combustion, and the burning of low grades of coal.

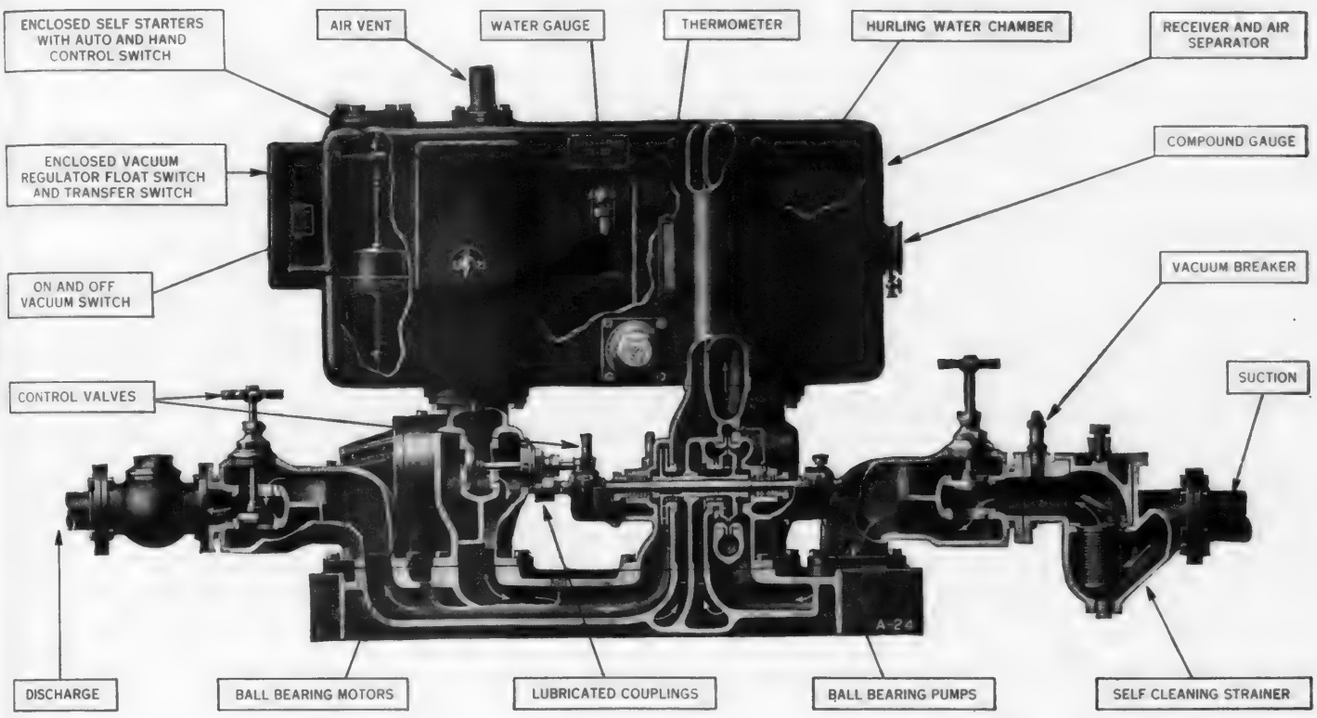
For two- or three-phase alternating current, the motors are of the variable speed type and are furnished with enclosed type speed regulators, with magnetic switches to provide overload and under-voltage protection, and an automatic regulator to start and stop the motor as the pressure or temperature changes.



Detroit Junior Stoker

By all means *COMPARE!*

THE AMES VACUUM HEATING PUMP



MAKE THE comparison complete, based solely on the heating system problem and the ability of the pump to solve that problem.

Comparisons such as this reveal the value of the AMES Pump and emphasize the fact that it is

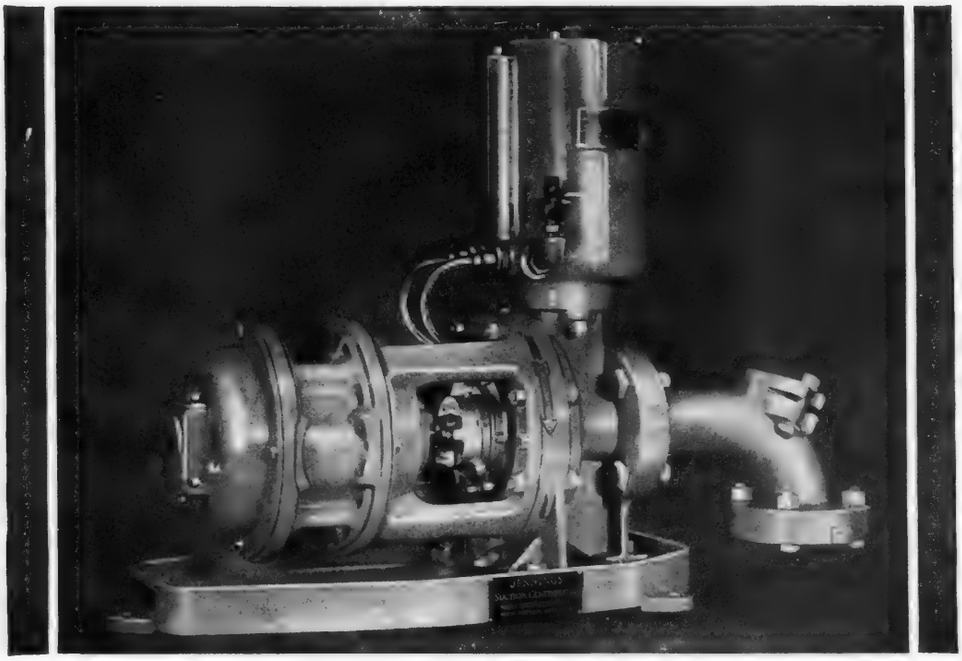
The Pump of Performance

AMES PUMP COMPANY, INC.

30 Church Street • New York City

Affiliated with **AMERICAN LOCOMOTIVE COMPANY**

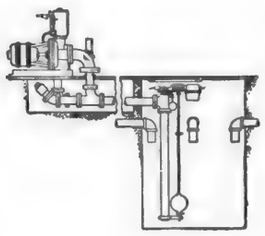
PERFORMANCE DISTINCTIVELY - DIFFERENT



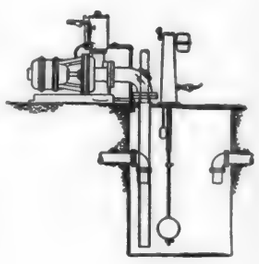
Jennings Suction Sump Pumps are furnished in standard sizes with capacities ranging from 30 to 250 g. p. m. Heads up to 60 ft.

Convenient to install . . . easy to get at

A bronze air rotor is mounted on the same shaft with the water impeller in the Jennings Suction Sump Pump. This rotor exhausts air from the casing and suction line, and permits the unit to handle air or gas along with the seepage being pumped.



Because of this suction feature, only the suction pipe need be submerged. And if there is no room to install the pump over the pit, it may be located wherever conditions necessitate. Or, if space permits, the usual arrangement of sump pump and controls at the pit may be employed.



Both the driving motor and pump of the Jennings Suction Sump Pump are of standard horizontal pattern. Being outside the pit, they are conveniently accessible. Since no vertical shaft is required, there are no thrust bearings to take care of. The only two moving parts—air rotor and water impeller—revolve without metal to metal contact in the casing. Long wear and dependable operation are assured.

Bulletin 97 gives complete information. Write for a copy.

Jennings Pumps

THE NASH ENGINEERING CO. 81 WILSON ROAD, SOUTH NORWALK, CONN.

Trade and Miscellaneous Notes

Coming Events

October 14-18, 1929. Eleventh annual convention of the American Gas Association at Atlantic City, N. J. Headquarters at Municipal Auditorium.

December 2-6, 1929. Annual meeting of the American Society of Mechanical Engineers in New York. Headquarters at the Societies' Bldg., 29 West 39th Street.

December 2-7, 1929. Eighth National Exposition of Power and Mechanical Engineering in New York. Headquarters at the Grand Central Palace.

January 27-31, 1930. Annual meeting of the American Society of Heating and Ventilating Engineers, Philadelphia, Pa. Headquarters at the Benjamin Franklin Hotel.

January 27-31, 1930. International Heating and Ventilating Exposition at Philadelphia, Pa., at the Commercial Museum.

New York Steam Corporation to Supply Grand Central Buildings

Arrangements have been completed by the New York Steam Corporation with the New York Central and New Haven railroads to supply the entire steam requirements of the Grand Central group of buildings. This group covers twenty city blocks from 42nd Street to 50th Street between Madison and Lexington Avenues and will be supplied more than 1,500,000,000 lbs. of steam annually. The volume heated will be 200,000,000 cu. ft.

Besides this group of buildings, the company also supplies such midtown buildings as the Lincoln Tower, Chanin Tower, Lefcourt buildings, Chrysler Tower, Fred F. French buildings, Salmon Tower, General Motors Buildings, New York Athletic Club, and many of the leading hotels.

American Radiator May Acquire Another Company

Officials of the American Radiator & Standard Sanitary Corporation state that negotiations are in progress for the acquisition of all of the capital stock of the Campbell Metal Window Corporation of New York and Baltimore. Application has been made to the Stock Exchange for listing 110,000 additional shares of stock which, it is understood, will be given in exchange for the stock of the Campbell company.

Campbell Metal Window Corporation specializes in the manufacture of windows for office buildings, apartment houses, hotels, etc., and, in conjunction with American Radiator & Standard Sanitary Corporation, has invented a metal window with a specially-designed sill permitting a new type of radiator to be suspended directly from the sill, giving the appearance and space-saving advantages of an enclosed radiator without impairing the heating value accompanying direct radiation. Many of the prominent buildings in New York and Chicago have installed this radiator and window.

E. K. Campbell Recovers from Accident

The many friends of E. K. Campbell, president of the E. K. Campbell Heating Co., Kansas City, Mo., will be delighted to learn that he has recovered sufficiently from his recent automobile accident to return to his desk.

Mr. Campbell was on his way to the summer meeting of the A.S.H.V.E. when his car was wrecked at Paupau, Mich., June 24. Mr. Campbell was cut about the head and had two ribs broken. He was taken to a hospital in Kalamazoo, where he remained three weeks.

Leod D. Becker New President of Electrol

Leod D. Becker, owner and publisher of *Fuel Oil Journal*, and a pioneer in the oil-burner industry, has disposed of his publishing interests, and has been elected president of Electrol, Incorporated, St. Louis, one of the largest burner manufacturers. Executive and sales offices of Electrol will be moved to New York City immediately.

W. T. Koken, who has been president of Electrol since 1925, becomes chairman of the board. M. E. Simpson, formerly general manager of the Electrol Distributing Corporation, which has been merged with Electrol, Incorporated, becomes vice-president in charge of sales. Lionel L. Jacobs continues as vice-president and general manager of the company.

Han A. Kunitz, formerly technologist of the American Oil Burner Association, has been appointed chief of research engineering, in charge of research and development. Lewis L. Scott, inventor of the original Electrol burner, who is a vice-president, continues as general consultant on patents and engineering. The officers, with W. L. Bechtold, of G. H. Walker & Co., St. Louis, investment bankers, and W. R. Bush, New York capitalist, constitute the directorate.

The new executive and sales offices will occupy an entire floor of the building at 227 East 45th St., New York, which adjoins the new Daily Mirror Building. The factory will remain at St. Louis.

N. A. M. P. Holds Largest Convention

With upwards of 1000 delegates registered and a "Million Dollar Exposition" of plumbing and heating materials, the forty-seventh annual convention of the National Association of Master Plumbers, held at the Hotel Statler, Buffalo, June 25-27, 1929, was the largest in the history of the association.

John A. Quinn, of Philadelphia, former vice-president of the N.A.M.P., was elected president. Other national officers for the coming year are vice-president, George H. Drake, Buffalo; treasurer, A. C. Eynon, Canton, O., and secretary, Maney J. Feeney, Philadelphia. Boston was selected as the convention city for 1930.

In the report of President Sheehan, it was announced that in accordance with a resolution, $3000 had been contributed to the association's scholarship fund and $15,000 to the Plumbing and Heating Industries Bureau.

Frank J. Fee, New York, chairman of the Scholarship Committee, reported that his committee had discussed the establishment of scholarships for more than the eight students now provided for. To maintain eight scholars an invested fund of $135,000 is needed, Mr. Fee reported. As the fund was short that amount by about $22,000, permission was given to ask the convention for subscriptions, and $6500 was pledged in response to the call.

Nominations for Officers of A. S. M. E.

The Nominating Committee of the American Society of Mechanical Engineers has presented the following nominees for the offices of the society for 1930: President, Charles Piez, chairman of the board, Link-Belt Company; vice-presidents, Paul Doty, chairman of the board, Minnesota State Board of Registration; Ralph E. Flanders, manager, Jones & Lamson Machine Company; Ernest L. Jahncke, Assistant Secretary of Navy; Conrad N. Lauer, president, Philadelphia Gas Works.

Oil Heating Association Elects Officers

At the annual meeting of the Greater New York Oil Heating Association, held at the Hotel Empire, New York, June 6, officers were elected for the coming year as follows: President, M. E. Simpson; secretary, S. B. Vreeland; treasurer, A. G. Baerenklau. Governors: Messrs. Simpson, Sage, Duncan, Purdy, Whoerlein, Pierce, Clark and Maynard.

International Combustion Publishes Magazine

In-Ce-Co Publishing Corp., a recently-organized subsidiary of International Combustion Engineering Corp., New York, announces the publication of a monthly magazine to be known as *Combustion* which will be devoted to advancing the standards of fuel utilization and steam generation. The first issue is dated July, 1929. The editorial policy will be to publish authoritative articles on steam power, generation, heating, efficiencies, merchandising, and associated topics by authors recognized as being thoroughly conversant with their respective fields. The right to use the name "Combustion" has been acquired from a magazine, heretofore published under that name, and which will be published henceforth under a different name.

Orders for Steel Boilers

Orders for 1749 steel boilers, comprising a total heating surface of 2,143,257 sq. ft. were placed in May, 1929, is the substance of a recent release of the U. S. Department of Commerce. Of these totals, the following will be of interest to the heating industry: Steel heating boilers, orders 1068, 486,682 sq. ft.; vertical fire tube, orders 119, 39,818 sq. ft.; horizontal return tubular, orders 137, 181,152 sq. ft.; water-tube boilers, orders 193, 1,230,568 sq. ft.

Creviston Resigns From Plumbing and Heating Industries Bureau

Russell G. Creviston has resigned as general manager and secretary of the Plumbing and Heating Industries Bureau, it was announced by the board of directors at the mid-year meeting of the bureau, held in Buffalo, June 23, 1929. Mr. Creviston originally came to the bureau in July, 1927, for the purpose of developing and promoting an enlarged program. It was stated that his resignation was due to changes because of inadequacy of funds to continue all

E. L. Flentje

phases of the enlarged program which the Plumbing and Heating Industries Bureau laid out in 1927. Mr. Creviston requested that his resignation go into effect September 1, but the board of directors, anxious to have the benefits of his services, accepted it as of October 1.

E. L. Flentje, well known throughout the industries because of his contacts with local, state, and national organizations, and because of his direction of the Philadelphia Market Development Campaign, was elected unanimously to succeed Mr. Creviston as secretary and general manager, effective October 1. Mr. Flentje joined the staff of the bureau four years ago and previously had extensive advertising and sales experience on the Pacific coast and in the Middle West.

1929 New York Engineers List

Professional Engineers and Land Surveyors is the title of the 1929 list, published by the University of the State of New York, Albany. The list contains the names and business addresses of the licensed professional engineers and land surveyors in the State of New York. Size 2⅞ in. x 5 in. Pp. 309.

Miscellaneous Notes

June building operations, as reported by the F. W. Dodge Corporation, show a decline of 7% when compared with the preceding month, but it must be remembered that the normal seasonal decline for June amounts to 6%. When compared with the June, 1928, total, the past month's total represents a decline of 16%. The total figures for the 37 states east of the Rocky Mountains were $545,891,100. Analysis of this record shows that 35% of all construction was for residential buildings, 22% for public works and utilities, 15% for commercial buildings, 13% for industrial buildings, and 8% for educational buildings.

Contracts in New York State and Northern New Jersey amounted to $107,757,700, representing a decrease of 12% from May, and 39% from the total for June, 1928. In the New England States figures amounted to $35,472,000, showing a decrease of 19% from the total for May and a 14% decrease from the total for June of last year.

In the Middle Atlantic States construction contracts amounted to $63,794,900, which showed an increase of 7% over the total for May of this year and a decrease of 16% from the amount started in June of last year. Contracts in the Pittsburgh district amounted to $58,145,100, representing a decrease of 19% from the total for May and 26% from the total for June, 1928.

The Central West reports contracts amounting to $187,893,100, which figure is 6% less than the amount for May and 2% less than the total for June of last year. Figures in the Northwest amounted to $8,808,200, showing a sharp decline from the total for May. There was a 34% decrease from that month but figures showed a 44% increase when compared with the total for June of last year.

Contracts in the Southeastern States represent a total of $70,198,100, showing an increase of 24% over the May total and 36% over the June, 1928, total. Texas reports contracts amounting to $13,822,000. This represents a decline of 36% when compared with the total volume of construction started during May and a decrease of 47% from the total for June of last year.

A cooperative agreement between the American Standards Association and the U. S. Bureau of Standards which will encourage national standardization activities in all industries, was ratified July 9, by George K. Burgess, director of the Bureau of Standards, and by the board of directors of the American Standards Association at its first meeting, as announced recently at the headquarters of the association, 29 West 39th St., New York.

Robert F. Prox, vice-president of the Frank Prox Co., was removed to his home last week and is on the road to recovery after being at the St. Vincent Hospital in Indianapolis, where he was taken following a crash with his airplane due to dense fog near Lebanon, Ind., July 8. Mr. Prox, who has been piloting a plane for some time, recently was made a member of the Terre Haute Airport Commission.

COMFORT

Broadway Savings Bank, Lawrence, Mass.
Architect: James E. Allan, Lawrence.
Heating & Ventilating Contractors: Bride, Grimes Co., Lawrence.

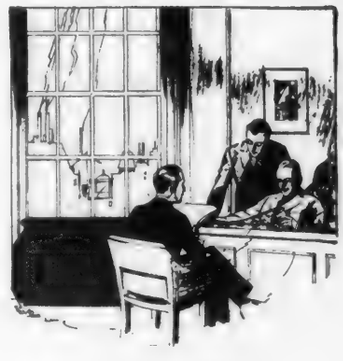
...without conspicuous steam connections

Unit Heater-Ventilators fitted in well with the requirements of the Broadway Savings Bank at Lawrence, Mass.

The Units were specially finished to match mahogany woodwork...and all steam connections were enclosed within the cabinets. They present a particularly pleasing appearance — thoroughly in keeping with the dignity of the institution.

Sturtevant Unit Heater-Ventilators are designed to draw in—from out-of-doors—controlled quantities of air; filter it clean, warm it to desired temperature and admit it to a room, noiselessly, safely,—without the hint of a draft. The temperature-controlling mechanism is simple and trustworthy...it may be entirely automatic or each unit may be manually operated if desired.

If you would be interested in a collection of pictures showing the application of Sturtevant Unit Heater-Ventilators to buildings, old and new, it will be a pleasure for our nearest Branch Office to send you our new Catalog No. 361



B. F. STURTEVANT COMPANY

Plants and Offices: Berkeley, Cal. ∿ Camden, N. J. ∿ Framingham, Mass. Galt, Ontario ∿ Hyde Park, Mass. ∿ Sturtevant, Wis.

Branch Offices at: Atlanta; Birmingham; Boston; Buffalo; Camden; Charlotte; Chicago; Cincinnati; Cleveland; Dallas, Denver; Detroit: Hartford; Indianapolis; Kansas City; Los Angeles; Milwaukee; Minneapolis; Newark; New York; Omaha; Pittsburgh; Portland; Rochester; St. Louis; San Francisco; Seattle; Washington, D. C. ∿ *Canadian Offices at:* Toronto; Montreal and Galt. ∿ *Canadian Representative:* Kipp Kelly, Ltd., Winnipeg. *Also Agents in Principal Foreign Countries*

Sturtevant *the Silent* Unit Heater-Ventilator

Reg. U. S. Pat. Off.

SUPPLIES OUTDOOR AIR ∿ FILTERED CLEAN ∿ AND TEMPERED

Manufacturers' Notes

Gorton Heating Corp., 96 Liberty St., New York, has appointed J. V. Dayton as sales representative in the eastern New York territory, north of and including Newburgh, and east of and including Utica. Mr. Dayton will have his headquarters at 58 Pennsylvania Ave., Albany.

Columbia Burner Co., Toledo, O., a newly incorporated organization, manufacturing the Columbia gas burner, announces the appointment of Henry J. Mandel as general sales manager in charge of both house-heating and industrial divisions. Mr. Mandel formerly was connected with the Surface Combustion Company as district sales manager, and previously was in the house-heating division. Executives of the new company include: President, Ernest A. Hall; secretary and treasurer, George A. Powers, and development engineer, Gordon Burns.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces the appointment of William G. Marshall as assistant to Vice-President T. P. Gaylord. Mr. Marshall for the past three years has been director of personnel for the Philadelphia Company and affiliated corporations, and in his new position he will have charge of employee relations.

Allen-Bradley Co., Milwaukee, Wis., has appointed F. L. Reynolds district representative in the western Michigan territory with headquarters at 4143 Ellsworth Ave., Grand Rapids, Mich.

Berryman System of Oil Heating, Inc., Chicago, Ill., announces the appointment of A. F. Lake as secretary and general superintendent. Mr. Lake is well known throughout the heating field by his connection for the past 20 years in the wholesale heating and plumbing supply business.

Wagner Electric Corp., St. Louis, reports the addition of W. H. Kretz to the transformer sales division to travel in the southwest. Mr. Kretz formerly was with the Jeffry De Witt Insulator Company.

The Bryant Heater & Mfg. Co., Cleveland, O., has appointed William E. Kaiser to take charge of the Cleveland sales and service office, formerly managed by C. E. Brister who has resigned after being a member of the Bryant organization for 20 years. Mr. Kaiser formerly was manager of the direct factory branch in Detroit.

Engineering Products Corp., 56 Amherst St., Cambridge, Mass., is a reorganization of the Mercury Switch Division of the Raytheon Mfg. Company. Some time ago the Raytheon company acquired the Fabrice Thermostatic Control Company, and the mercury switch department of the Q. R. S. Music Company, both of Chicago. The new company manufactures mercury switches for oil burners, electric refrigerators and other automatic equipment. New officers are: President, Delbert E. Replogle; treasurer and general manager, Theodore M. Burkholder; secretary, H. H. Lewis.

Time-O-Stat Controls Co., Elkhart, Ind., has opened New York sales offices in the Salmon Tower Bldg., 11 West 42nd Street, which will be the headquarters for all eastern salesmen. Carl W. Scholle will be in charge of these offices and act as contact man throughout the eastern part of the country.

Bryan Steam Corp., Boiler Division, Peru, Ind., has transferred Frank L. Lusher, formerly general field representative, to the home office where he will be special contact man between the trade and the office. Lawrence E. Dimond, Ralph Woodard, and William H. Van Der Veen, formerly with the American Radiator Company in Indianapolis, Ind., Flint, Mich., and Grand Rapids, respectively, have been appointed as representatives for the Bryan company in those territories.

The Metropolitan Nokol Dealers Association, New York, announces that George J. Woehrlin has been appointed a special technical representative to assist, without obligation, with any automatic oil-burner estimates or specifications. Headquarters of Mr. Woehrlin will be at 4 East 39th St., New York.

Timken-Detroit Co., Detroit, Mich., has opened a Chicago branch office which will be the first entry of Timken into the Chicago market. Timken oil burners will be displayed.

Williams Oil-O-Matic Heating Corp., Bloomington, Ill., announces two important staff promotions and the creation of a new sales department. R. O. Ahlenius, who has been with the company since August, 1928, has been promoted to a newly-created position, that of general manager. W. J. Brevitt is now general sales manager. The new sales department, headed by M. E. Ticen, has been created for the company's stove business. Another announcement is that Marshall Field & Co., Chicago, has taken the franchise for the sale of Ice-O-Matic refrigerating machines in their retail store.

Roberts-Gordon Appliance Corp., formerly the Roberts Gas Burner Corp., 128 West Chippewa St., Buffalo, N. Y., announces its removal to new offices in the Curtiss Bldg., Buffalo. M. J. Roberts will continue as president. The other officers will be: vice-president and general manager, W. S. Gordon, Jr.; general sales manager, Ray Landers; assistant sales manager, J. C. Bowery. Mr. Gordon formerly was vice-president and general manager of General Plastics, North Tonawanda, N. Y. Mr. Landers recently has been business manager of the Danbury and Bethel Gas Co., Danbury, Conn.

Sheffler-Gross Co., Inc., 203-11 Drexel Bldg., Philadelphia, heating, ventilating, and power plant equipment engineers, announces that Justin J. McCarthy has been appointed sales engineer for the company.

Hajoca Corp., Philadelphia, Pa., announces the appointment of Charles P. Hackett, for many years associated with the boiler, radiator and heating industry, as a representative of the heating department of the corporation for Philadelphia and surrounding territory.

Petro Oil Burner Corporation of New York, Inc., 101 Park Ave., New York, wholesale distributors of Petro oil-heating equipment, has appointed A. L. Kimball as divisional manager of the Westchester, Putnam, Dutchess and Bronx counties territory. Mr. Kimball formerly was branch manager of the Boston and Westchester County territories for the Socony Burner Corporation and the Timken-Detroit Company.

Silent Glow Oil Burner Corp., 1000 Park St., Hartford, Conn., announces a new name for its oil burner, the Silent Glow Sunflower heater. The company recently moved from 191 Franklin Ave. to the above address.

Silent Automatic Corp., Detroit, has made the following appointments: G. L. Toohey and Robert L. Pryde, both formerly with Electrol, Inc. of St. Louis, will represent the company in the State of Michigan and in eastern Pennsylvania, respectively. Mr. Pryde's headquarters will be at Philadelphia.

Chicago Pump Co., Chicago, announces the following additions to its sales representation: P. S. Lord with offices at 406 Weatherly Bldg., Portland, Ore.; W. K. Hornbuckle as manager of the Memphis office of the Southern Sales Company which represents the Chicago Pump Company in several states of the south.

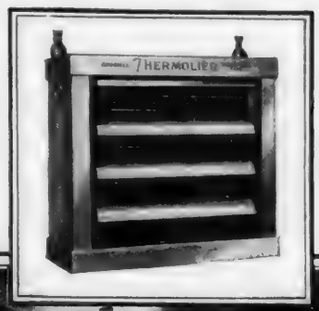
Errata

In the July issue of HEATING AND VENTILATING, it was incorrectly stated that P. S. Lord and W. K. Hornbuckle had become associated with the Weil Pump Co., of Chicago. Announcement concerning these two men should have appeared under the Chicago Pump Co., of Chicago, as noted in above item.

J. W. Hull Plumbing and Heating Company and not the Hoshall Machinery Company are the Memphis representatives of the Weil Pump Company.

Thermolier
the copper unit heater

Made in six capacities to fit any space and every condition.



Toledo Parking Garage, Inc. *Superior Street, Toledo, Ohio.* Mills, Rhine, Bellman and Nordoff. *Architects and Engineers.* Pioneer Plumbing & Heating Company, *Heating Contractor.*

Heat *where* you want it *when* you want it, instantly, automatically, cheaply

TAKE Toledo Parking Garage, Inc., for example. Twenty-two Thermolier unit heaters are installed above the entrances and exits, up over the ramps, and on all six floors of this most modern garage, housing 700 cars.

Thermoliers can be operated singly or together, to meet changes in the weather, with consequent savings in fuel. The Mercoid temperature control automatically turns on, turns off, one or more Thermoliers, giving uniform, *even* heat throughout wide floor spaces or localized areas, at lowest possible costs.

Thermolier unit heaters give heat *where* wanted, *when* wanted. Placed *up* out of the way, forcing heat *down*. Installed by your local heating contractor. All piping overhead. No basement boiler required.

Write Grinnell Company, 208 West Exchange St., Providence, R. I., for the Thermolier booklet "Fourteen Points of Superiority."

GRINNELL COMPANY

Executive Office: Providence, R. I.

Branches in all Principal Cities

Classified Advertising

Advertisements under this heading, $2 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

HEATING AND VENTILATING — 521 5th Ave., New York City.

INDUSTRIAL ENGINEERING COMPANY, location Newark, requires services heating engineers experienced in Webster or Dunham heating systems. Write giving complete information. Address Box 71, care of Heating and Ventilating.

SALES MANAGER—National building material manufacturer has an opening for a high grade man to take charge of the sales of house insulation materials. Experience in the sale and direction of sales of insulation materials is essential and a technical education is desirable. Excellent opportunity for the right man. Reply in confidence giving full details of age, education and experience. Our own men know of this opening. Address Box 72, care of Heating and Ventilating.

MANUFACTURER'S AGENT covering western New York and northwestern Pennsylvania wishes to correspond with manufacturers of heating equipment who desire representation in this territory. Steel boiler, invisible radiators, valves, etc. Address Box 68, care of Heating and Ventilating.

REGISTERED ENGINEER — Twelve years experience design and supervision mechanical equipment buildings, also some estimating experience, desires permanent connection with established engineering, architectural or contracting organization in responsible engineering or executive capacity. Age 36, married. Address Box 70, Heating and Ventilating.

MANUFACTURER'S AGENTS — Something new—VAPOR—VACUUM AIR VALVE. Exclusive territories available to responsible parties. State territory you desire. Address Box 69, care of Heating and Ventilating.

This classified advertising section is a service that consistently brings together the manufacturers of the industry and the men of desired calibre and experience to mutual advantage.

BIG BUSINESS SAYS!

"Prepare NOW to reap YOUR share in the coming years of great business Prosperity."

HARKEN to this Command, O Ye Shop Owners, Salesmen, Mechanics, and others. Fortunes will be made in these next few years by those who KNOW. Devote this Summer to personal preparation in a technical way for going after the bigger paying jobs—the ones with the larger yearly incomes. Build big with big prosperity; our Engineering Service is at your command. Check the subject you prefer, and mail today—full information is free.

- ☐ Heating and Ventilating Engineering.
- ☐ Special Steam and Water Heating.
- ☐ Scientific Warm Air Heating.
- ☐ Plumbing and Sanitary Engineering.
- ☐ Contracting and Estimating.
- ☐ Mechanical Drafting.

Saint Louis Technical Institute
Est. 1910.
The most thorough institution for Technical Home Study to-day.
4543 Clayton Avenue St. Louis, Mo.

HOT WATER

From the Atlantic to the Pacific you will generally find the largest and the finest buildings equipped with Whitlock Service Heaters

COPLEY PLAZA, *Boston, Mass.*

BILTMORE HOTEL, *Los Angeles, Calif.*

A 'phone call to our nearest office—consult your local telephone directory under our name—will bring one of our Hot Water Engineers—who will gladly work with you.

New York Philadelphia Baltimore Los Angeles
Boston Chicago Detroit San Francisco
and other principal cities. Consult telephone book.

THE WHITLOCK COIL PIPE COMPANY

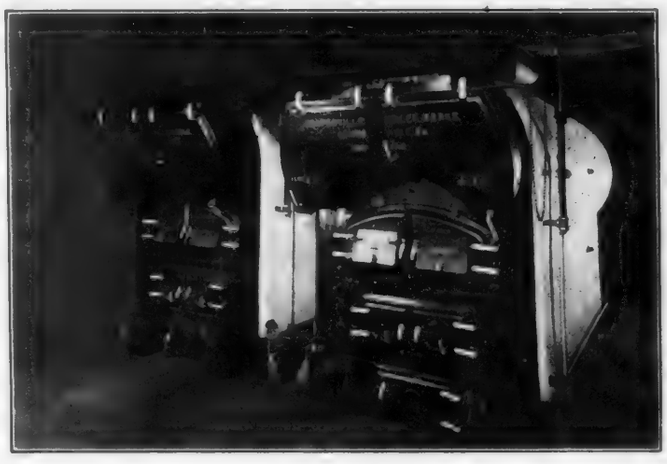
40 South Street, HARTFORD, CONN.

COATESVILLE BOILERS

HEATING MODERN SCHOOL BUILDINGS

QUAKERTOWN HIGH SCHOOL, QUAKERTOWN, PA.

This modern school building, complete in every detail, is equipped with Coatesville Welded Steel Fire Box Boilers designed for smokeless combustion of bituminous coal.



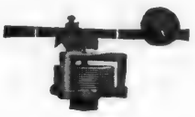
CLAYTON J. LAPPLEY, Architect
J. M. O'DONNELL, Heating Contractor

COATESVILLE BOILER WORKS
Boilers - Tanks - Steel Plate Work

Main Office and Works—COATESVILLE, PA.

Signs on the Business Highway

No. 45-A
For House Heating Water Boilers.



No. 22-J
For Low Pressure Steam Boilers.

READ THEM! Heed them! They're the same old signs on the same old pike. Each year it leads you back to winter weather and bigger business opportunities. Check up now on the profit possibilities in your territory. Let us assist you in telling the owner of the towering hotel, office building, apartment or modest home the distinct advantages of

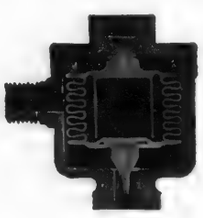
Sylphon TRADE MARK

DAMPER REGULATORS

Built around the original and only genuine Sylphon Bellows a one-piece, seamless, solderless, flexible and durable diaphragm, they have for sixteen years perfectly solved the problem of checking and increasing drafts in proportion to steam pressure or water temperature. They prevent fuel waste, —save labor and care. Factory equipment on the leading makes of boilers, they have been successfully used in hundreds of thousands of heating plants. *Remember;—there is a Sylphon Damper Regulator for every Steam, Hot Water or Vapor Heating Plant.*

Quick Vent Valves

Sylphon Quick Vent Valves also employ the Sylphon Bellows as their thermostatic element. For freeing radiators, heater coils, mains and risers from air they are unequalled. They make the heating system flexible and efficient. They are everlastingly durable. Breakdowns are eliminated, because years of constant use or the power action of steam will not weaken the Sylphon Bellows.



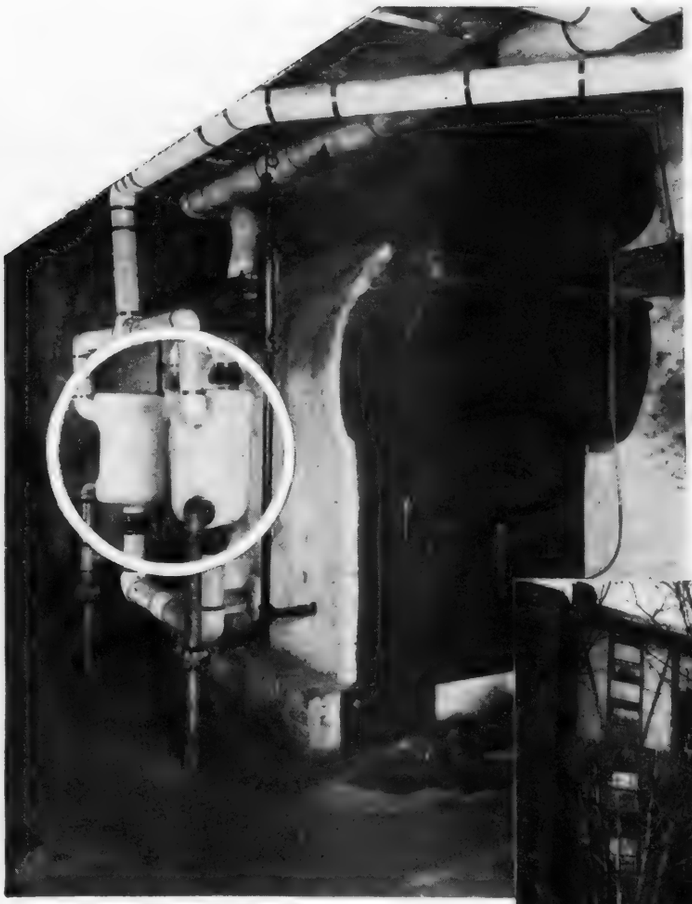
No. 510
Cut Open View.

No. 527
Cut Open View.

Send for illustrated literature covering the various Sylphon Damper Regulators and Sylphon Quick Vent Valves—their construction and installation. Ask for particulars of our "dealer helps." Write Dept.-H.

FULTON SYLPHON Co.
KNOXVILLE, TENN., U.S.A.

Representatives in all Principal Cities in U. S. A.—European Representatives, Crosby Valve & Eng. Company, Ltd., 41-2 Foley St., London, W. 1., England—Canadian Representatives, Darling Bros., Ltd., 140 Prince St., Montreal, Que., Canada



Large Installation SUCCESSES Continue

Summer and winter, two No. 36 Excelso Water Heaters supply 61 families at 600 E. 21st St., Brooklyn, N. Y.

Excelsos installed by Better Oil Burner Corp., 16 Court St., Brooklyn, N. Y.

Open View of Excelso Triple Copper Coil Heater

REMOVABLE copper coils with patented ground joint brass connections—exclusive with Excelso Indirect Water Heaters. There is no substitute for Excelso in design or profit.

BROOKLYN, like other chief American cities, appreciates the absolute reliability and economy of the Excelso way of heating the domestic water for apartments and other large buildings.

Ease of installation, surety of operation at lowest possible cost guarantee a satisfactory, profitable job for both owner and contractor.

Write for catalog of complete information and instructions for installing these most satisfactory heaters.

Excelso Products Corporation

DIVISION OF AMERICAN RADIATOR COMPANY

59 Clyde Avenue :-: Buffalo, N. Y.

Nationally Distributed by Leading Wholesalers and Boiler and Radiator Manufacturers

EXCELSO INDIRECT WATER HEATERS

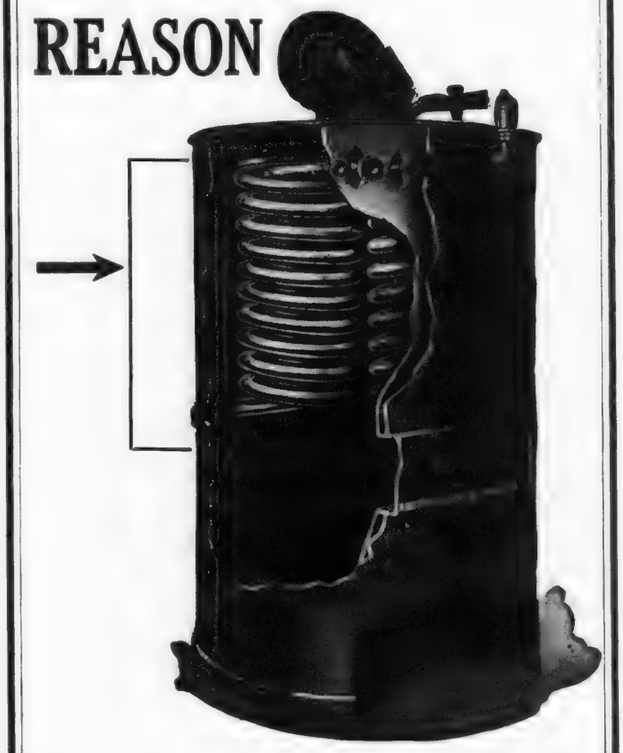
SIZES FOR ONE FAMILY OR ONE HUNDRED FAMILIES

HERE

IS

THE

REASON



FOR OIL BURNING

The coils are so designed and placed in the *Coil Boiler* that they present a heat absorbing area, DIRECTLY exposed to the radiant flame, almost impossible to obtain as effectively in any other manner.

This fact is the big reason for the marked success of COIL BOILERS. It is the reason these boilers deliver up to 30% more efficiency at a cost far below normal.

A letter asking for complete details will receive our very prompt attention.

MONITOR BOILER CO., 1505 Race Street, Philadelphia, Pa.

Stop Noise at the Source

FANS, motors, pumps and similar machines are generally the source of more or less vibration and noise. Conducted throughout the building by ventilating ducts, walls, floors, pipes and structural framework, they frequently become a troublesome nuisance, especially in apartment houses, hotels, office buildings, schools, churches and factories.

Noise can be greatly reduced or completely stopped by isolating the vibrating machine with Armstrong's Cork Machinery Isolation. A cushion of this material between motor, fan or pump and its foundation breaks up and absorbs the greater part of the vibrations, and deadens the noise.

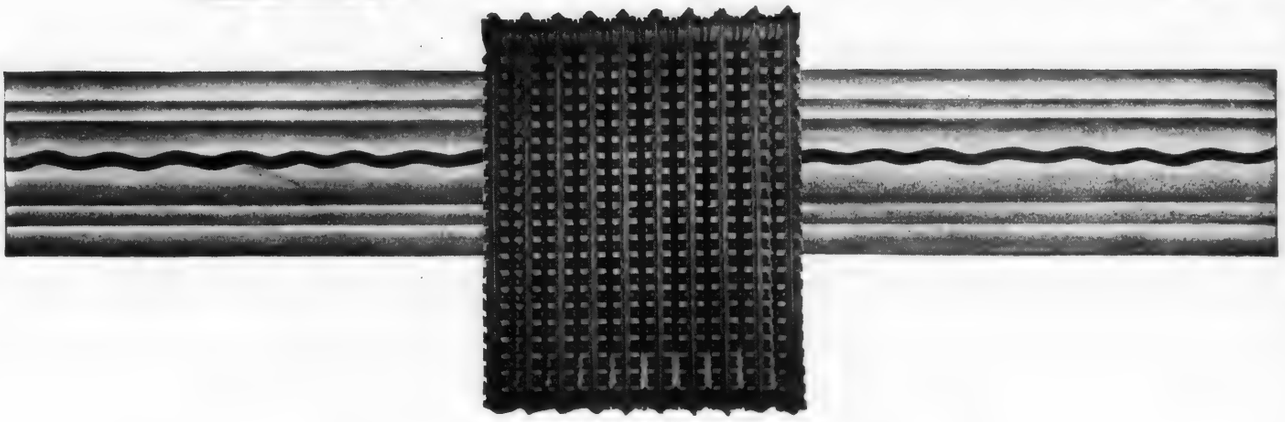
Armstrong's Cork Machinery Isolation is a manufactured product made from pure granulated cork pressed into resilient, vibration-absorbing boards. It is made in three densities, permitting correct adaptation of the material to any type of machine. Armstrong's Cork Machinery Isolation is economical and non-deteriorating. For a very few dollars, a machine can be permanently isolated.

Write for complete data and application details. There is no obligation whatsoever. Armstrong Cork & Insulation Company, 925 Concord Street, Lancaster, Pa.; McGill Building, Montreal; 11 Brant Street, Toronto, 2.

Armstrong's Cork MACHINERY ISOLATION

Ⓐ EVERY BOARD TRADEMARKED

2 types of heating



VENTO

CAST IRON HEATERS

FOR twenty-five years, since its introduction, leading Engineers and Architects have enthusiastically endorsed Vento. Today the millions of square feet in successful operation in America's greatest buildings stand as conclusive proof of its complete success. Its record is really remarkable for never has there been one instance of failure.

Vento Heaters are made from high quality, close grained cast iron that will not deteriorate under the action of air gases or water—their life is actually unlimited.

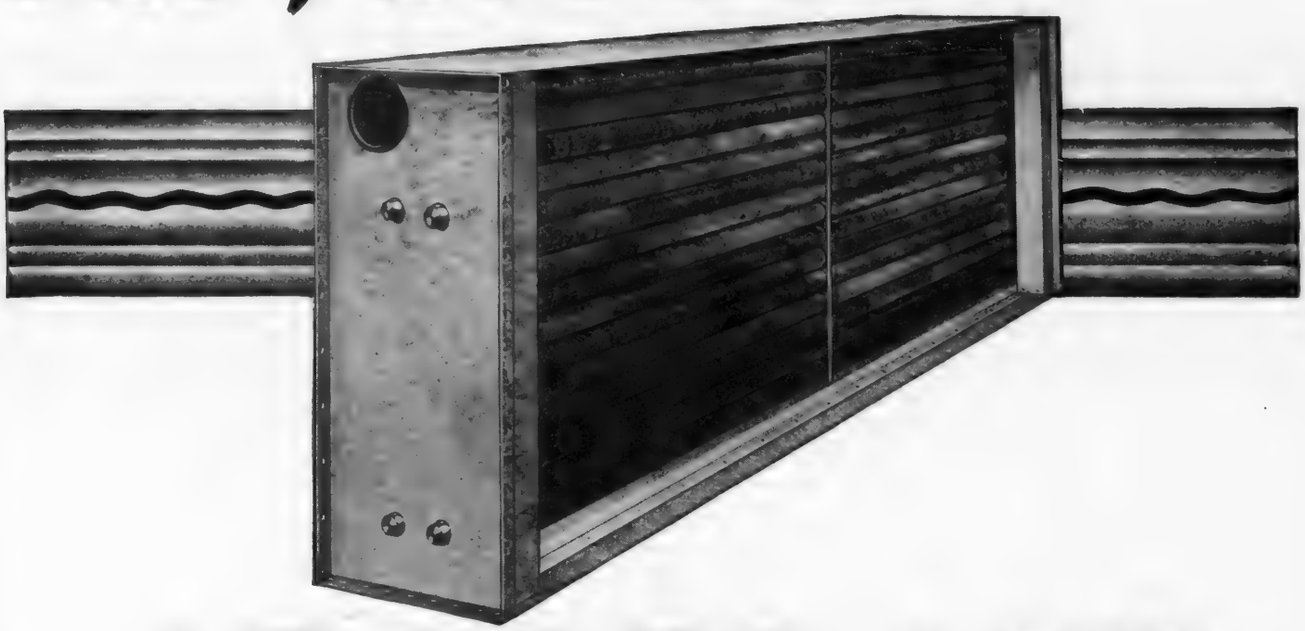
But the outstanding feature of Vento is its design or unique construction which breaks up air currents and insures rapid steam circulation—full heating efficiency from the entire surface of heater.

If you are not familiar with Vento, let us tell you of an installation near you—see it in operation and talk to the engineer.

AMERICAN RADIATOR

816 So. MICH. AVE., CHICAGO—40 W. 40th ST., NEW YORK, N.Y.

indirect surface . . .



ARCOBLAST

ENCASED HEATERS

THIS new light weight surface will appeal to the Engineer and Architect who is figuring heating surface for central fan and plenum chamber work where the pressure range is between 5 and 200 lbs.

The Encased Arcoblast Heater is especially designed for installations where the building construction will not permit the use of the heavier cast iron surface.

Features of the new Encased Arcoblast–

Galvanized Encasement — complete and ready for pipe connections.

No soldered steam backed joints.

Tubes expanded in headers—insured ample strength for high pressures.

Non-Corrosive—heating surface entirely non-ferrous metal.

Assured strength with minimum weight.

The Arcoblast Heater is composed of staggered rows of copper tubes expanded into cast iron headers—on the opposite side of which are registering tapped openings through which the tubes are expanded. After the expanding operation the holes are closed with counter-sunk plugs.

The three-quarter inch copper tubes are fin wound with extended copper surface—metallically attached, with six turns per lineal inch. Their all-over diameter is 1½".

COMPANY

Branches Everywhere

SEND FOR NEW CATALOGUE

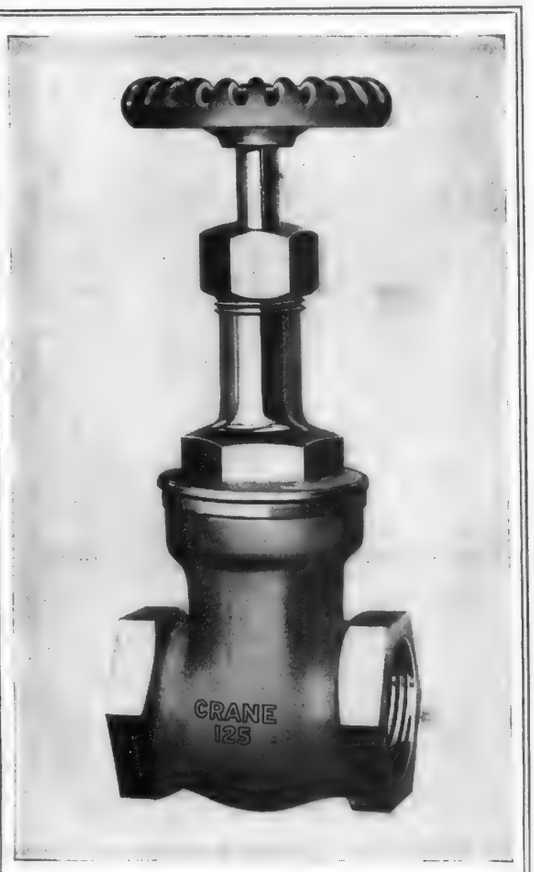
Write today for the new catalog giving complete engineering data.

150 Pounds Pressure CRANE VALVES 2500 Pounds Pressure

A new brass gate valve

In designing this new line of brass gate valves, for S. W. P. up to 125 pounds or cold water pressure up to 175 pounds, Crane Co. engineers paid particular heed to these points:

(1) *Service*—Valves are of the rising stem type with a solid wedge slip-on disc. The stuffing-box can be repacked while the valve is under pressure. The handwheel is of malleable iron. (2) *Strength*—The body and disc are of special Crane steam brass. The bonnet, stem, and stuffing nut are of forged brass. (3) *Accuracy*—Carefully fitted guides and ribs insure true and easy movement, prevent wear on the disc face, and also prevent the disc from touching the seat except at the point of closing.



This new brass gate valve, exemplified by the No. 431 pictured here, has been designed to give the most efficient service.

Examined from a viewpoint of design, or materials used, or workmanship, these valves are worthy to carry on the Crane 74 year tradition of excellence.

CRANE

GENERAL OFFICES: CRANE BUILDING, 836 S. MICHIGAN AVENUE, CHICAGO

NEW YORK OFFICE: 23 W. 44TH STREET

Branches and Sales Offices in One Hundred and Eighty Cities

MODERNIZE WITH CONVERSIONS

Almost overnight the
GAS CONVERSION SITUATION
has assumed New Significance

NOW SELL
Automatic Tailor Made
GAS CONVERSION HEATING SYSTEMS

NOT so many years ago, GAS heat was looked upon as a "high-priced luxury." But—a few years previous to that—so was a bathroom and *any* heating system.

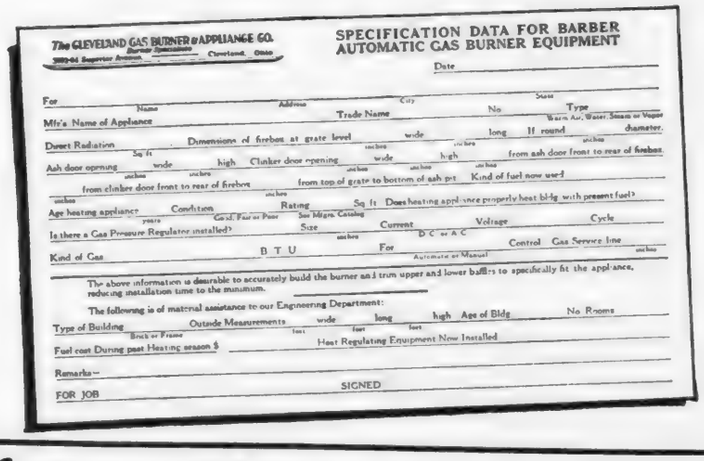
The bathroom and the old style heating system had to pass through the stage of public test which has now established them as necessities. So, during the past few years, GAS heat has been undergoing the same test.

Through the efforts of the makers of Barber *Automatic* Jet Gas Burners, Gas heat has been reduced to a simple science, that is now within the reach of every home in the land.

The makers of Barber *Automatic* Jet Gas Burners have likewise removed all of the old sales obstacles to Gas heat and have substituted a plan that is just as simple, just as effective and just as sure as the operation of Barber Burners themselves.

The Barber Specification Data Sheet and the New Barber catalog are all you need to have to make some handsome profits on Barber "Tailor-Made" *Automatic* Gas Conversion sales. Let us tell you how the gas conversion market has been made ready for you to reap big profits in. Write today!

The CLEVELAND GAS BURNER & APPLIANCE CO.
Burner Specialists
3102-04 Superior Avenue, Cleveland, Ohio



The CLEVELAND GAS BURNER & APPLIANCE CO.
Burner Specialists
3102-04 Superior Avenue, Cleveland, Ohio

SPECIFICATION DATA FOR BARBER AUTOMATIC GAS BURNER EQUIPMENT

Date _____

For _____ Name _____ Address _____ City _____ State _____

Mfr's. Name of Appliance _____ Trade Name _____ No. _____ Type _____ Warm Air, Water, Steam or Vapor

Direct Radiation _____ Sq. ft. Dimensions of firebox at grade level _____ inches wide _____ inches long _____ If round _____ inches diameter.

Ash door opening _____ inches wide _____ inches high Clinker door opening _____ inches wide _____ inches high from ash door front to rear of firebox _____ inches

from clinker door front to rear of firebox _____ inches from top of grate to bottom of ash pit _____ inches Kind of fuel now used _____

Age heating appliance _____ years Condition _____ Good, Fair or Poor Rating _____ See Mfgrs. Catalog Sq. ft. Does heating appliance properly heat bldg. with present fuel? _____

Is there a Gas Pressure Regulator installed? _____ Size _____ inches Current _____ D. C. or A. C. Voltage _____ Cycle _____

Kind of Gas _____ B T U _____ For _____ Automatic or Manual Control _____ Gas Service line _____ inches

The above information is desirable to accurately build the burner and trim upper and lower baffles to specifically fit the appliance, reducing installation time to the minimum.

The following is of material assistance to our Engineering Department:

Type of Building _____ Brick or Frame Outside Measurements _____ feet wide _____ feet long _____ feet high Age of Bldg. _____ No. Rooms _____

Fuel cost During past Heating season $ _____ Heat Regulating Equipment Now Installed _____

Remarks— _____

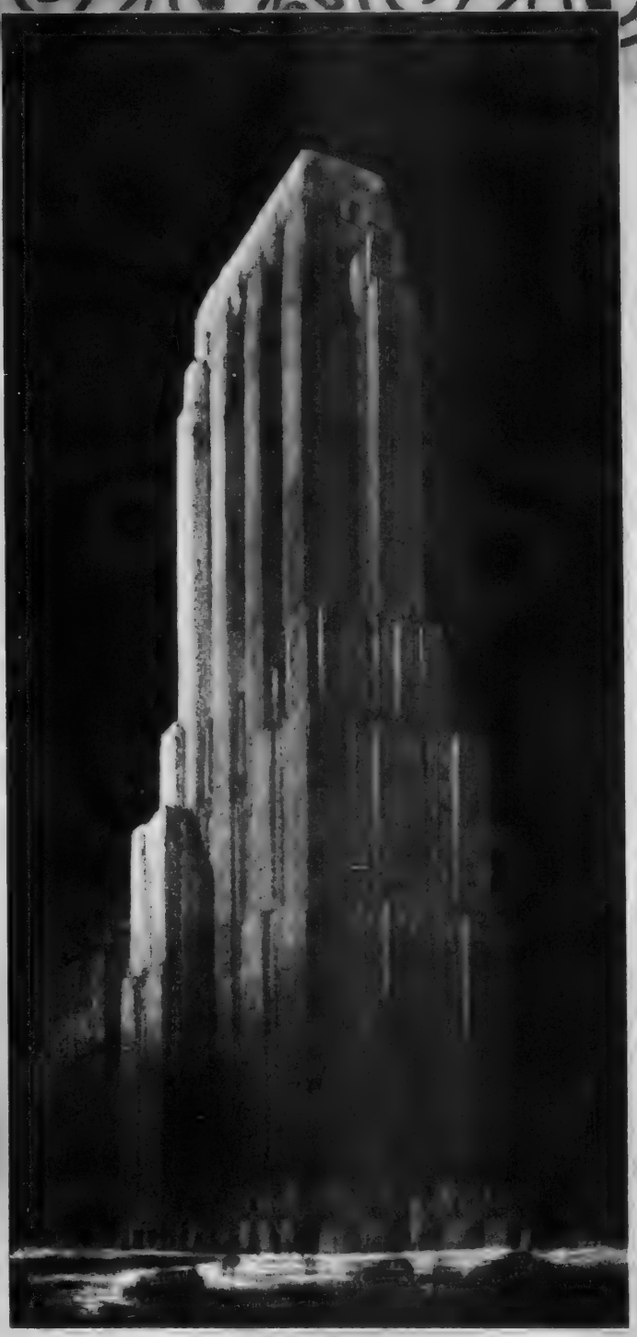
FOR JOB _____ SIGNED _____

BARBER *Automatic* JET GAS BURNERS

Preferred

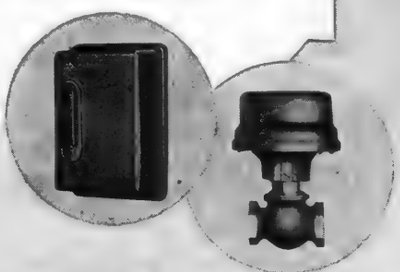
Prominent, new buildings are including Johnson Heat & Humidity Control. Johnson installations are not occasional; but general, widespread, customary. The definite benefits produced by Johnson Control are fully appreciated: fuel economy of 25 to 40 per cent with the better temperature comfort for efficiency and the essential hygienic condition desired. And Johnson Heat & Humidity Control holds first place, preferred position in the estimation of building authorities because of the thorough completeness of Johnson Control, the utter reliability, effectiveness and permanency which The Johnson System and its accurate operation have strongly established.

JOHNSON SERVICE COMPANY
Since 1885
MILWAUKEE, WISCONSIN
Branches In All Principal Cities



THE PALMOLIVE BUILDING
CHICAGO, ILLINOIS
HOLABIRD & ROOT, ARCHITECTS
THE LUNDOFF-BICKNELL CO. BUILDERS

EQUIPPED WITH
JOHNSON HEAT
AND HUMIDITY
CONTROL



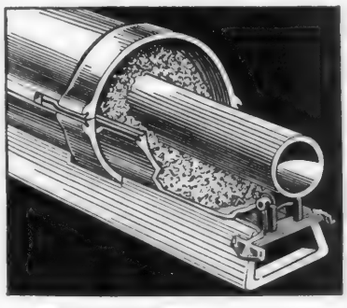
JOHNSON HEAT & HUMIDITY CONTROL

Ric-wiL Engineering made this Possible!

ON a Friday morning we received an order for 80′ of 12″ Ric-wiL Conduit complete, needed for a service connection to a theatre in Cleveland. The order was shipped in the afternoon and reached the job the next day.

1. At 12:10 Saturday night a section of Euclid Avenue was marked "No Road" and the excavation began.
2. By 4:00 o'clock Sunday morning the trench was dug and graded, Ric-wiL Base Drain Foundation, pipe supports and bottom halves of conduit were installed.
3. By 10:00 Sunday morning the 4″ steam pipe was in and welded, insulation was all applied, top halves of conduit were installed and Loc-liP joints cemented.
4. Backfilling was complete at 3:45 o'clock, practically no delay being necessary on account of cement setting.
5. Paving was re-laid and the street opened again to traffic by 7 o'clock Sunday evening—*less than 24 hours after work was started.*

Only Ric-wiL design, the result of Ric-wiL engineering, made this speed possible. And this same engineering explains the fact that efficiency tests of Ric-wiL are averaging from 92% to 94% efficiency. You cannot afford to overlook this conduit for your next job.



This is Ric-wiL Type F with Dry-paC insulation, one of the 4 types of Ric-wiL Conduit which meet all conditions.

The Ric-wiL Company
1567 Union Trust Bldg., Cleveland, Ohio
New York Baltimore Atlanta Chicago

Originators of Waterproof Conduit Filler

Ric-wiL

UNDERGROUND CONDUIT

This would be news IF—

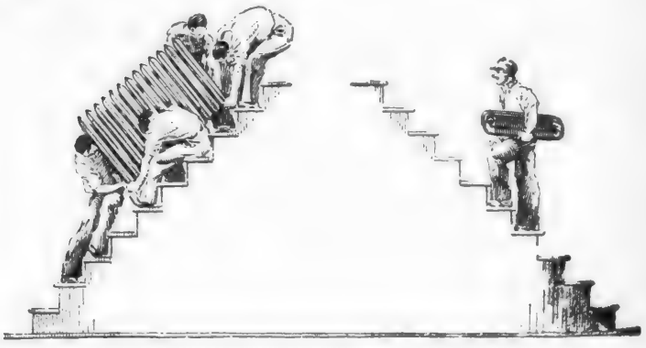
It *would* be news if the radiator had been cast iron. When we learn, however, that a ROBRAS 20-20 had been carried up, the incident becomes one of no importance.

We all know that ROBRAS 20-20 Radiators weigh somewhere near a pound a foot, complete with fittings. Why, a man can carry a forty foot radiator almost as easily as he carries his lunch! As you know, the weight of these radiators is about 20% that of an equal cast iron radiator.

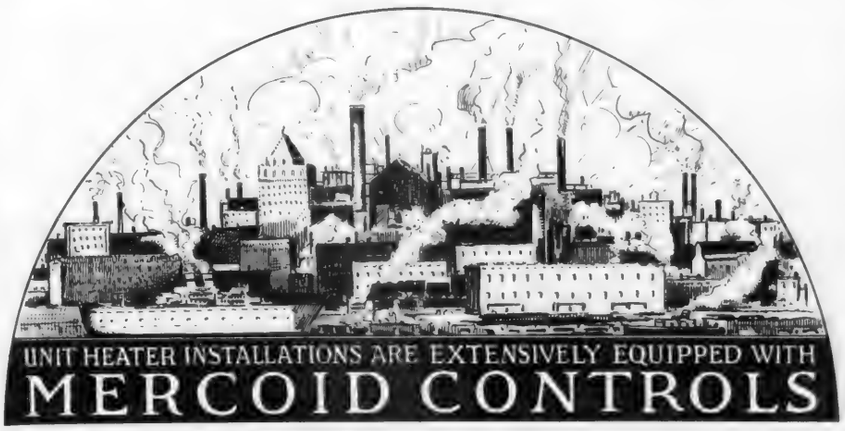
That's why there is a real profit in installing ROBRAS 20-20's. Their light weight makes installation so easy that a couple of men can install from four to five times as many of them a day as they can install equal cast iron radiators.

Then, too, ROBRAS 20-20's are quality products and there is a larger profit for the heating contractor for every foot he sells. Send now for our new price list and data sheets. They are in an envelope waiting for your name.

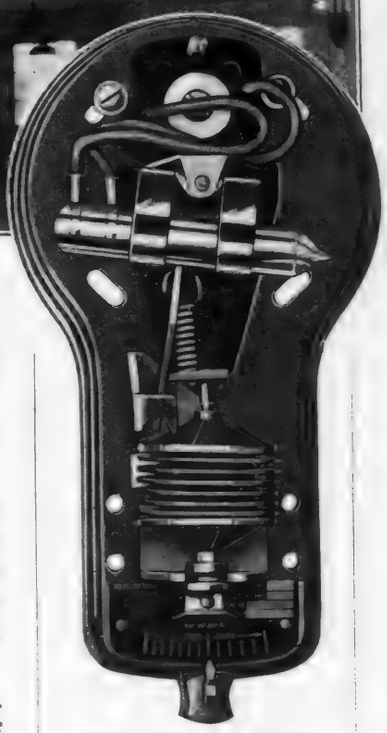
ROBRAS 20-20
RADIATORS



ROME BRASS RADIATOR
CORPORATION
ONE EAST FORTY-SECOND STREET ❦ NEW YORK CITY



A Modine Unit Heater installation using Mercoid Controls in a trunk factory.



Patents issued, others Pending
1598874, 1640869, 1658013

The above illustration is a view of Mercoid Thermostat with cover removed, showing the Mercoid sealed switch operated with the Mercoid snap-action movement.

INDUSTRY

is rapidly being sold on efficiently-controlled unit heaters.

Mercoid Controls are well known for their unfailing performance. They have stood the test of dependable service, over a long period of years, during which time they have gained the confidence of the trade.

Unit heaters equipped with Mercoid Controls, are an evidence of good faith that only the best is used.

The Mercoid Engineering Department will gladly assist on any Unit heater control problem.

THE MERCOID CORPORATION

564 WEST ADAMS STREET
Chicago, Illinois, U.S.A.
New York Office: 25 Church Street, New York, N. Y.

MERCOID CONTROLS

TESTED PROTECTION!

AUTOMATIC ANTHRACITE HEAT

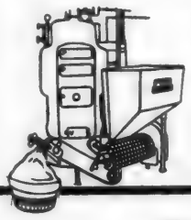
WHAT IT MEANS TO YOU!

The **Electric Furnace-Man**

IN the laboratories where experiments are continually being conducted for the possible betterment of The ELECTRIC FURNACE-MAN, it is also put to exhaustive tests. These tests have time and again proven its worth and they are your guarantee of "Tested Protection." When you install The ELECTRIC FURNACE-MAN you KNOW that it will accomplish its work—safely—economically—efficiently.

Tested Protection does one other thing for you. It assures you that profits made will stay profits and not turn to losses through necessary "free servicing" and "trouble-shooting" which in turn lead to dissatisfied customers.

The ELECTRIC FURNACE-MAN burns ANTHRACITE—buckwheat or rice. Used in thousands of homes. Fits any heating plant. Ideal for hot water supply.



Let us give you complete details of the ELECTRIC FURNACE-MAN and tell you also how we can help you.

Patented Product of

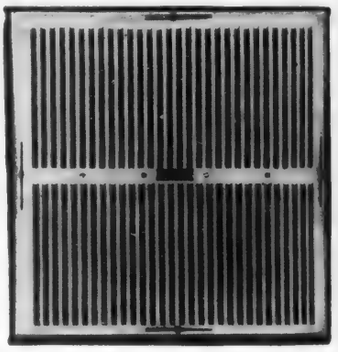
DOMESTIC STOKER COMPANY

Gillespie Building, Seven Dey St., New York

The Nose can't stop Germs and Dust

Tests made by the U. S. Weather Bureau in St. Louis showed 17,600 particles of dust per cu. ft. of air. That means an average person inhales in excess of a tablespoonful of dust and soot every 24 hours. And that dust often contains germs of typhoid fever, tuberculosis, influenza, etc., is proven by tests made in a Boston Hospital, which showed nearly 450 living bacteria in 10 liters of air. Prevent dangerous bacteria from spreading disease by installing Protectomotor Panel Air Filters in public buildings.

This filter also saves building owners thousands of dollars yearly now spent to clean paint and replace furnishings, paper, paintings, etc.



The Protectomotor positively keeps 99-9/10% of the dust and soot out of buildings. Its initial cost is low and the maintenance cost nil, for no oil drains or cleaning tanks are required.

This filter operates from 2 to 6 months without cleaning and can be cleaned in about half a minute per panel with our vacuum cleaner. It maintains the resistance below any specific static pressure drop.

Our catalog contains a wealth of interesting information. Write for it.

STAYNEW FILTER CORPORATION

109 N. Water St., Rochester, N. Y.

PROTECTOMOTOR

REG. U.S. PAT. OFF.

Perfect Positive Protection

PANEL AIR FILTER

Inside the Holland Tunnel under the Hudson River.

The Presbyterian Hospital, New York City.

The New York Life Building, New York City.

The George A. Posey Tube, linking Oakland and Alameda, California.

Four Classics of Ventilating Science

. . . . *and initiative!*

. . . The Holland Tunnel with its specially built giant fans handling 1400 tons of air per minute;

. . . The Presbyterian Hospital, New York, one of the most modern—and exacting—heating and ventilating achievements. 369,000 cubic feet of outdoor air, properly tempered, supplied every minute;

. . . The New York Life Building where one million cubic feet of air is supplied every minute to an army of workers;

. . . The George A. Posey Tube linking Oakland and Alameda, California,—flooded with 80 tons of pure air every minute—unfailingly!

It is significant that Sturtevant equipment was the choice of the Architects and Engineers for all of these striking examples of American constructional genius . . . But the reason that the name "Sturtevant" is linked with these great enterprises is because of the superior operating characteristics of Sturtevant ventilating equipment!

It would be a pleasure to send you the Catalogs which describe in detail the Fans, Turbines or other equipment operating in the above mentioned tunnels and buildings. Please address our nearest Branch office.

B. F. STURTEVANT COMPANY

Plants and Offices at: Berkeley, Cal., Camden, N. J., Framingham, Mass., Galt, Ontario., Hyde Park, Mass., Sturtevant, Wis. *Canadian Representative*: Kipp Kelly, Ltd., Winnipeg, *also Branches in Principal Cities and Agents in Foreign Countries.*

Sturtevant

REG. U.S. PAT. OFF.

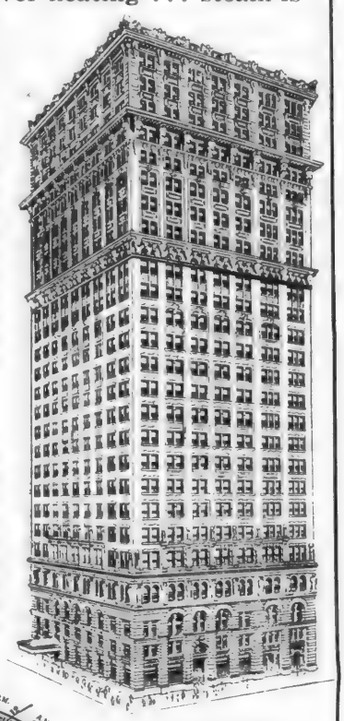
HEATING-VENTILATING AND POWER PLANT EQUIPMENT

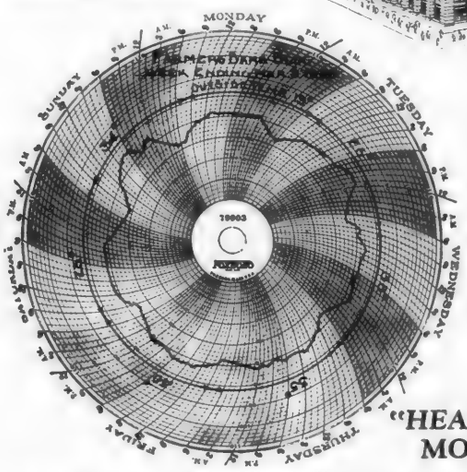
Do you know - - - - - - Farmer's Building, Pittsburgh fully maintains comfort with heat turned off 50% of the time?

And do you know that this remarkable steam heating economy was effected through the use of the Hornung Pressure and Thermostatic System of Master Control? And that observations made and compiled on various other representative installations show equally gratifying results ... not only due to the practically constant day temperature maintained, but also to the great economies effected? *Records show that during the heating season steam is turned off such systems at least 50% of the time!* The Hornung Master Control valve prevents over-heating ... steam is shut off when nobody needs it and fuel consumption is stopped.

The Master Control installed in the 24-story Farmer's Bank Building consists of one ten-inch main reducing valve, two eight-inch, one four-inch, and one two-inch motor-driven thermostatic valves located in the various branches of heating main. *The savings effected in first heating season more than returned the initial investment.*

Chart Below Shows inside temperature for one week with the mean outside temperature noted. At 19 degrees outside temperature, the maximum cooling rate with all heat shut off was nine degrees in six and one-half hours, while on a 34-degree day it was nine degrees in ten hours.





FARMERS BANK BUILDING, *Pittsburgh.*

Full details are given in our special Bulletin sent free on request.

"HEAT LOST IS MONEY LOST"

CENTRAL HEAT APPLIANCES

J. C. HORNUNG—Engineer

343 So. Dearborn Street, Chicago, Ill.

Special Summer Discount on Daniels' "Home Study Course in Gravity Steam and Water Heating"

A thorough knowledge of the complexities of modern gravity steam and water heating will certainly prove to be a direct path to greater success in your business.

To help you gain this knowledge, HEATING AND VENTILATING offers you a complete Home Study Course in Gravity Steam and Water Heating. This comprehensive course has been compiled by A. M. Daniels, and is based on his many years' experience in the Bureau of Home Economics of the U. S. Department of Agriculture. It is published in loose-leaf form, with special cloth ring binder and is available for a limited period, at the special price of $8.

▼ ▼ ▼

Complete details will be gladly sent at your request. Just write HEATING AND VENTILATING, 521 Fifth Ave., New York.

The Snap Action Blade
and what it does

RELIABILITY in the room temperature control is essential to the success of any automatic heating system. Any failure of this important unit is sure to result in discomfort and inconvenience for the owner.

The Snap Action blade, an essential and exclusive principle in the Time-O-Stat Temperature Regulator, accounts in large measure for the lasting reliability of these instruments. It is true that the current carried in the circuit is comparatively small, but it is enough to cause miniature arcs if circuit breaking is not accomplished suddenly. Arcs cause burning and pitting of the contact points, and sooner or later, such action will result in sticking or failure to make contact at all.

The Time-O-Stat Snap Action blade operates on the same principle as wall switches carrying the lighting load, motion arising from the thermal element. It makes and breaks with a definite, decisive movement. Burning is reduced practically to zero, with resultant long life for the points and for the satisfaction of the owner.

This is but one outstanding feature which shows the care and long experience which has gone into the design of the Time-O-Stat Temperature Regulator. You can be sure that every part, every movement, has been created to give the maximum in satisfactory service. And, aside from the strictly mechanical design, there is a beauty, a harmony of line, about the instrument as a whole which is entirely in keeping with its excellent mechanism.

Full details about this room temperature control may be had for the asking. Our engineering department will be only too glad to show you how this instrument may be applied to the correct solution of your room temperature control problems.

TIME-O-STAT CONTROLS COMPANY
ELKHART, INDIANA

"Gas-Fired Unit Heaters"

Again Show Greater Efficiency, Low Operating and Installation Costs in Modern Factory Heating.

METAL AIRCRAFT CORP.

Cincinnati, Ohio

2,100,000 B.T.U. Heat Loss

600,000 cu. ft. Space

All Steel Construction with 70% Glass exposure.

heated at cost of $.0023 per cu. ft. space per season without the loss of floor space.

100% Electric Automatic Thermostat Control

"STERLING"

DIRECT GAS-FIRED **Unit Heaters**

Built under Patent No. 1,638,083. Others pending. Infringements will be prosecuted.

Maintain uniform temperatures essential to aircraft plants, industrial buildings.

Tremendous savings in first cost, operation and maintenance.

"SUNNYAIRE" HEAT CABINETS—"SUNNYAIRE" HOUSE HEATING FURNACES furnished with forced air fan circulation, direct gas fired,—our newest development in heating equipment. Approved by "A.G.A."

NO Boiler Room, Boilers, Coal Storage, Stokers, Radiators, Ashes, Grit or Dirt, Smoke or Soot, or Licensed Firemen

TEXO SALES COMPANY, Inc.

Originators of the Gas-fired Unit Heater

MANUFACTURERS

241 Walnut Street CINCINNATI, OHIO

Below: Interior of the Metal Aircraft Corp. Bldg., Cincinnati, O., heated by "Sterling" gas-fired unit heaters, using 385 cu. ft. of 900 B.t.u. mixed gas per hour and having a total heat delivery of approximately 2,100,000 B.t.u. Offices heated by "Sunnyaire" Heat Cabinets.

MASTER HEAT REGULATOR

WIDE changes in fire regulation with waste of fuel are prevented by the Master Heater Regulator.

Its **gradual** operation of valves or dampers insures the utmost uniformity of temperature.

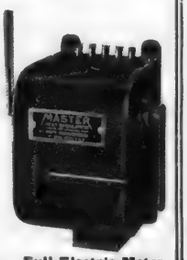
Thermostat shows position of valves or dampers at all times, thus indicating to the user the condition of the fire.

For coal, gas or oil—in any heating system or combination. Clock or plain models.

Sell the latest and best. Write for complete details.

W-M-C Water Thermostats

For hot water heating systems—accurate, dependable and inexpensive. Easily installed without draining the boiler or interfering with fire. Write for Details.



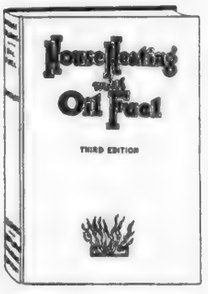
Full Electric Motor

White Mfg. Co.

2362 University Ave., St. Paul, Minn.

House Heating with Fuel Oil

By P. E. FANSLER



32 Chapters

Universally Acclaimed and Recognized

The most complete work available on modern oil heating in all its branches.

Each copy includes an Iso-Degree Day Map in colors of the United States.

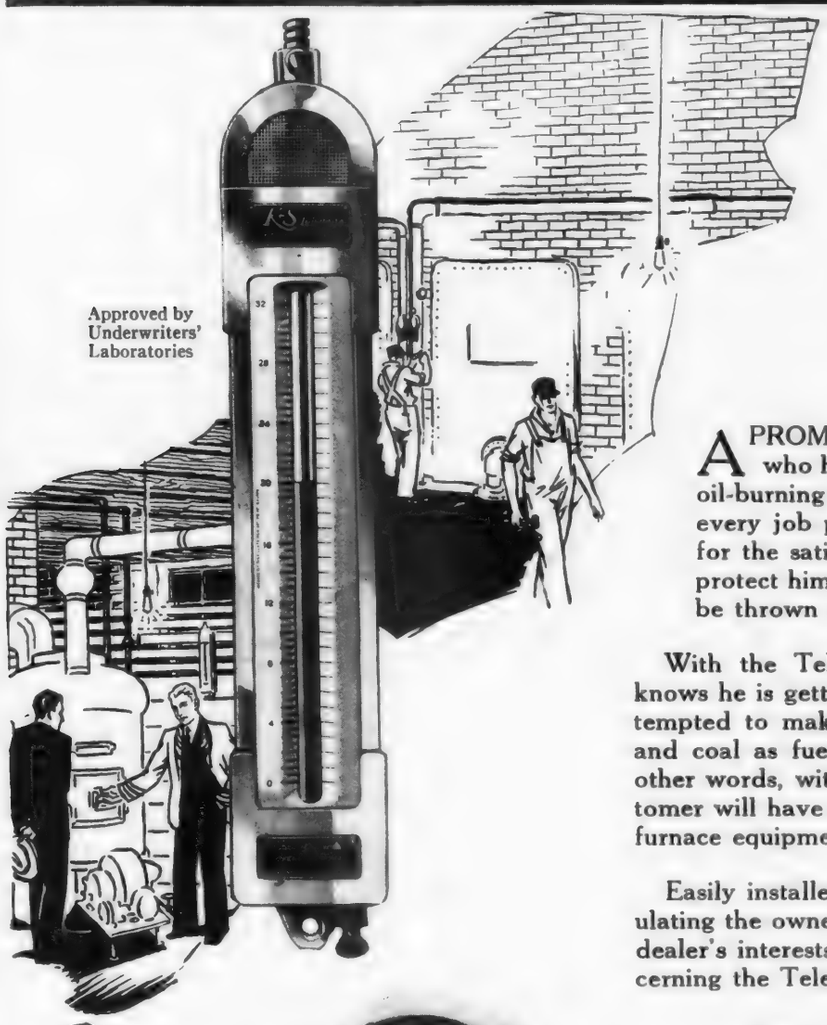
362 Pages More Than 150 Illustrations Price $4.00

Published by

HEATING AND VENTILATING

521 Fifth Avenue New York City

THE HYDROSTATIC DISTANT READING GAUGE



Approved by Underwriters' Laboratories

To Protect Yourself As Well As Your Customer

A PROMINENT and very successful merchant who has built up a very fine business in selling oil-burning furnace equipment says that he equips every job possible with a K-S Telegage, not alone for the satisfaction it will give his customer, but to protect himself against trouble that might otherwise be thrown on his shoulders.

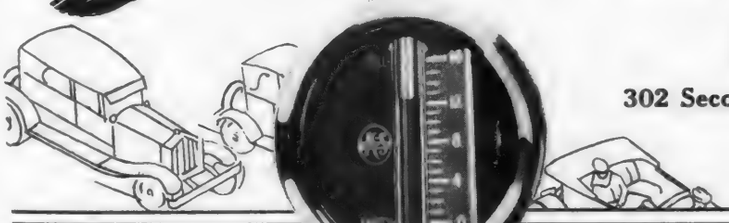
With the Telegage on guard, the customer always knows he is getting all the oil he pays for, and he is not tempted to make unfavorable comparisons between oil and coal as fuel, based on inaccurate information. In other words, with the K-S Telegage on guard, your customer will have a higher regard for the efficiency of the furnace equipment you sell him.

Easily installed the Telegage takes care of itself, regulating the owner's oil burner service, and protecting the dealer's interests. Write for complete information concerning the Telegage, and our dealer's proposition.

KING-SEELEY CORPORATION

302 Second Street ANN ARBOR, MICHIGAN

New York—44 Murray Street
Chicago—472 Wrigley Building



The K-S Telegage

BE CERTAIN WITH THE *K—S TELEGAGE*

Standard factory equipment on three-fourths of all cars selling for $700 or more.

Give 'em Heat in their Bed Rooms

IN those far corners, in those northwest bedrooms, those places where it is always difficult to get heat to penetrate. Bryan Oil Burning Boilers will do the job. The heating capacity of the Bryan Copper Tube Boiler is practically unlimited. Our No. 8 will keep the medium sized house as warm as toast on the coldest day ..... and do it economically, too.

The selling of Bryan Boilers is surprisingly easy. The many superior features are so convincing that the potential customer can readily see their advantage.

Write for detailed dealer proposition TODAY!

BRYAN
STEAM CORPORATION
BOILER DIVISION
PERU, INDIANA U.S.A.

The

THERMO SYPHON TRAP

—leaves silence on the job as well as safety

WHEN the heating system goes into operation, it is a comfort to building owner, manager and occupant alike to know that noiseless operation is assured by a THERMO SYPHON TRAP.

Maintenance of water level, too, by these dependable devices is "Life Extension" for boilers, on all vapor, vacuum, atmospheric, and modulation systems .... on one or two pipe steam systems from less than atmospheric up to twenty pounds pressure.

Send for Bulletin No. 16-HV giving full details. We solicit correspondence on heating difficulties.

HIGH GRADE Return, Vacuum, Lifting and Separating Steam Traps, Reducing Valves, Blow-off Valves.

LYTTON
MANUFACTURING CORPORATION
FRANKLIN, VIRGINIA

Helping to put the new greenbacks into circulation

Some of the Kennedy Products

Bronze Valves
Gate, Globe, Angle, Check and Radiator Types.

Iron-Body Valves
Low, Medium and High Pressures, Manual, gear, cylinder and electrical control.

Pipe Fittings
Malleable Iron, Brass or Bronze Screwed Fittings, Cast Iron Flanged Fittings and Flanges.

Fire Hydrants

THE Bureau of Engraving and Printing at Washington, D. C., where our paper currency is printed, is one of scores of public buildings which are being served by Kennedy Valves.

Year after year, these valves have been faithfully doing their share in the proper functioning of this important government plant. Their operation has been thoroughly reliable, with practically no attention or maintenance expense.

Your own clients deserve the same kind of valve service that Uncle Sam is getting here. You can give it to them by using Kennedy Valves, and still further assure satisfactory service from your piping jobs by standardizing on Kennedy Pipe Fittings as well.

Specify Kennedy on your next order for Valves and Pipe Fittings and you will assure minimum pipe fitting time and labor for your men and maximum service and satisfaction for your clients.

Send for the Kennedy Catalog.

The Kennedy Valve Mfg. Co.

New York Chicago San Francisco Philadelphia Cleveland
Atlanta Los Angeles El Paso Seattle

KENNEDY

VALVES-PIPE FITTINGS-FIRE HYDRANTS

Speed Reduction... *integral with the Motor*

NO GEARS NO BELTS NO PULLEYS

TO FULLY appreciate the remarkable economy of weight and space and the high efficiency made possible by the use of the Crocker-Wheeler Speed Changer, study the following comparison of two induction motors.

Parallel Type Reducer Ratio 6:1

Motor *Without* Speed Changer		Motor *With* Speed Changer
10 H. P.	Power	10 H. P.
360 R. P. M.	Motor Speed	1750 R. P. M.
360 R. P. M.	Delivered Speed	360 R. P. M.
1350 lbs.	Total Weight	450 lbs.
13 1/2 inches	Center Height	7 3/8 inches
35 3/4 inches	Length	31 inches
75%	Efficiency	87%
70%	Power Factor	93%

And as you may expect, this small high speed motor equipped with speed changer costs less to buy than the large low speed motor without it.

We will gladly make a similar comparison for you of other size motors. Any predetermined speed reduction may be made within the ratio of 4:1 to 10:1. A Crocker-Wheeler engineer will gladly call and tell you the story of small high speed motors delivering power at low speed . . . with efficiency.

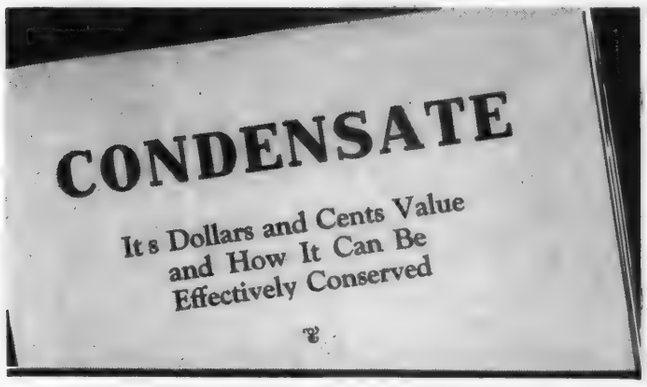
The Crocker-Wheeler Electric Mfg. Co.

Ampere, New Jersey

Branch Offices

Birmingham Boston Buffalo Chicago Cleveland Denver Detroit
Cincinnati Houston New York Philadelphia Pittsburgh San Francisco Seattle

CROCKER WHEELER



Everyone interested in STEAM TRAPS should have a copy of THIS BOOK

Just off the press

It covers the subject of steam traps thoroughly,—in terms which the non-technical man can understand.

It makes clear why condensate should be drained from steam lines and steam-using apparatus *and conserved.* It shows how to compute the substantial savings which are effected by the proper draining and conservation of condensate.

It describes the different classes of steam traps and explains their construction, operation and conditions for which each class is suited.

It tells how to select the proper kind and size of trap for any specific application.

It is fully illustrated and printed in large type for easy reading.

Heating Engineers, Plant Engineers, and Executives of all plants using steam, will find much of interest in this 40-page manual. A copy will be gladly sent, entirely without cost or obligation, to anyone requesting it on the business letterhead of the organization. The edition is limited. Requests will be filled as they come in. Write for your copy today.

The W. B. Connor Co., Inc.

369-A Lexington Avenue
NEW YORK, N. Y.

Manufacturers of Non-Return and Pumping STEAM TRAPS

Your clients will never need to go to the expense of replacing a worn out Patterson Indestructo Hot Water Heater. The complete copper lining makes it proof against destructive attacks of rust—makes it practically everlasting.

Water does not touch anything except *copper.* So there's no possibility of rust eating holes in the metal or backing up into the pipes and retarding circulation and increasing coal bills.

We *guarantee* the Patterson Indestructo to prevent discoloration of water from rust.

Send for a copy of our Catalog.

The Patterson-Kelley Co.
107 E. 40th St. New York City

Patterson
Indestructo
Copper Lined
Hot Water Heater

Water Tube Type

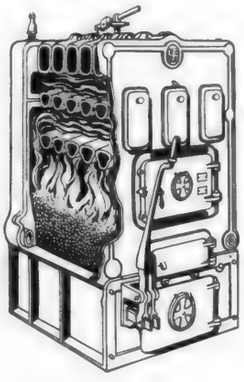
Burnham Boilers

Rake Out the Heat

Raking out heat for your customers is the best way to rake out business for yourself.

The insides of a Burnham boiler are a series of tooth lined flues, that certainly do rake in the heat.

Take a look. See for yourself.

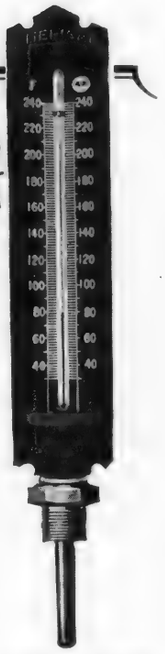


Burnham Boiler Corporation

IRVINGTON, NEW YORK

Representatives in all principal Cities of the United States and Canada

WHEN TEMPERATURES ARE IMPORTANT



Only the Best Thermometer Pays

THE American Industrial Thermometer is accurate. When requested, a test certificate is issued with each thermometer, which assures its accuracy by comparison with a U. S. Bureau of Standards Certified Thermometer. Never guess at temperatures and never take chances with the accuracy of the thermometer you buy.

The case is made of cast brass, "V" shaped, all black enameled. A plate glass front protects the scale. The scale is hand-calibrated to its respective tube and the subdividing lines are engraved (not stamped). The glass tube is thoroughly annealed for 6 days for permanent accuracy. Only double distilled mercury is used, and the tube is filled with nitrogen gas to prevent separation of the mercury column. The bulb chamber is Monel Metal, giving maximum strength and protection against corrosion.

American Thermometers are made in all styles for every industrial purpose. Scale sizes are 7", 9" and 12". Standard ranges are from minus 40 to 1000° F. When temperatures are important, only the best thermometer pays.

Specify Catalogs Desired.

American Glass Thermometers	F-14
American Quality Gauges	A-14
American Recording Gauges	E-14
American Dial Thermometers	G-14
American Recording Thermometers	H-14
American Temperature Controllers	R-14

AMERICAN INSTRUMENTS

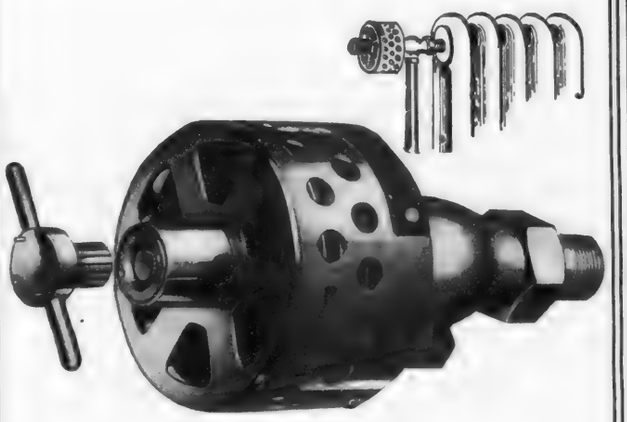
SINCE 1851

CONSOLIDATED ASHCROFT HANCOCK CO., INC.

Bridgeport, Conn.

Subsidiary of Manning, Maxwell & Moore, Inc.

Sterlco
TRADE MARK



A Turn of the Key gives them the temperature they want

That's the way to eliminate heat complaints. A turn of the key gives the desired temperature "Warm, Normal, or Cool." Tests made by the University of Pennsylvania prove the efficient performance of Thermotrols in maintaining an even temperature.

Sterlco-Roys Thermotrol

Individually installed, controlled and operated

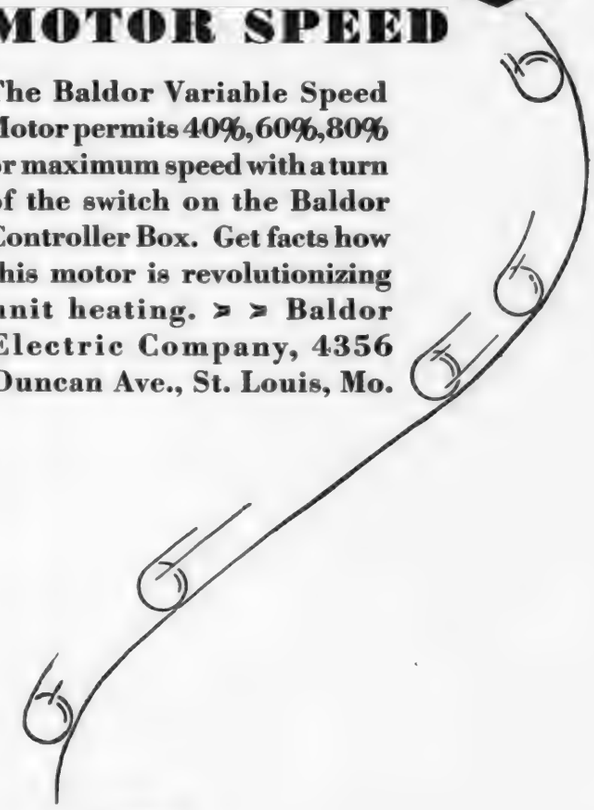
No compressed air apparatus or electrical connections are required to completely equip a building with Thermotrols. They are attached directly to the radiators—individually controlled and operated. The Thermotrol keeps down fuel costs by reducing the flow of steam to the radiator when the desired temperature has been reached. No fluctuation or waste of heat which makes for fuel economy.

Write for Bulletin No. 44.

STERLING ENGINEERING CO.
1626 Holton Street MILWAUKEE, WIS.

CONTROL HEAT WITH MOTOR SPEED

The Baldor Variable Speed Motor permits 40%, 60%, 80% or maximum speed with a turn of the switch on the Baldor Controller Box. Get facts how this motor is revolutionizing unit heating. » » Baldor Electric Company, 4356 Duncan Ave., St. Louis, Mo.



BALDOR
A BETTER MOTOR

AEROPLANE PLANT

Heated with

Young Unit Heaters

Stinson Aircraft Corporation, Wayne, Michigan

All unit heaters effect a saving over old fashioned heating methods, but Young Unit Heaters effect a saving over other unit heaters because of superior design, lower power cost, greater flexibility, and sturdier construction. Bulletin H-429 gives the details. Send for it.

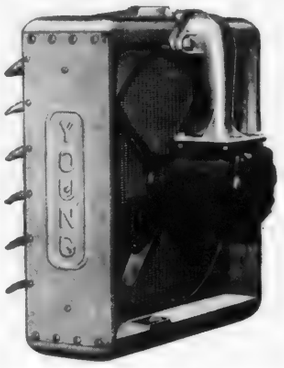
YOUNG RADIATOR COMPANY

Heating Division

RACINE WISCONSIN

Representatives in principal cities

Correspondence invited on open territories



Young Quality

Reg. U. S. Pat. Off.

Y. R. Co. *Built for endurance and maximum performance*

WE are splendidly equipped to supply all types of finned tubing for copper radiation.

CORRESPONDENCE INVITED

THE G & O MANUFACTURING COMPANY

New Haven, Conn.

Established 1915

Manufacturers of the famous "G & O" Radiators for automotive vehicles

And Now • • •

a *small* submerged type storage water heater for the 1 to 10 family job. Send for data.

DAVIS ENGINEERING CORP.

90 West St., New York City

Paracoil

WATER HEATERS

Courtesy
United Electric Light
& Power Co.

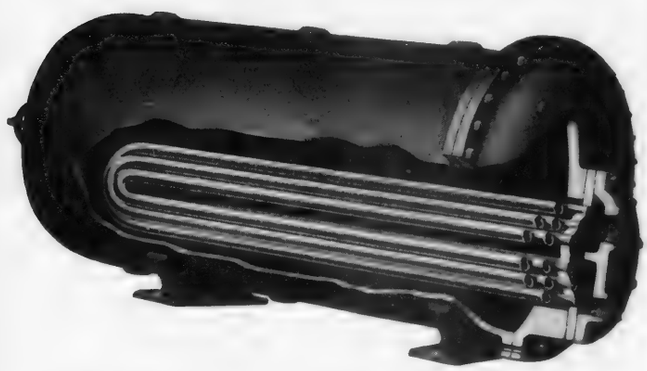
New York Medical Center

Psychiatric Division

is serviced by National Storage Heaters, U Bend type. For all exacting needs where dependability is paramount, National Heaters may be specified without qualifications. They are designed specifically for the job to be done, fabricated in the modern National plant, and will give all or more in performance than called for. Let us quote on your next heater installation.

Send for National bulletins No. 55 and No. 65

NATIONAL Storage U BEND TYPE Heaters



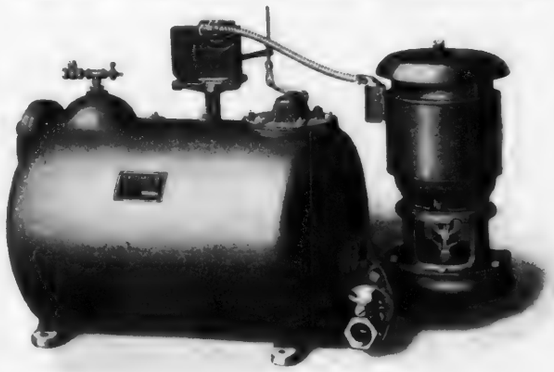
THE NATIONAL PIPE BENDING CO.

Established 1883 **120 River Street**

NEW HAVEN, CONN.

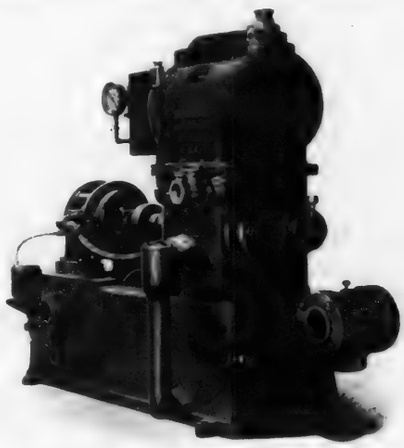
Boston **New York** **Philadelphia**

Low Water Line Control



THE Skidmore Condensation Pump is furnished in all sizes with cast iron receivers of large water capacity, the motor being supported on a rigid cast iron volute bolted to the end of the receiver. A float switch is mounted on top of receiver and connected to motor with flexible conduit.

The centrifugal impeller is of bronze enclosed type and is locked on the end of the shaft against bronze sleeve which extends through the stuffing box over the extended shaft of the motor, which is of ball bearing type, of ample capacity and standard make. *Bulletin No. 7 gives you full details.*



Low water line control without pitting is made possible with The Skidmore Vacuum Pump on interceptor base.

The unit is self-contained, ball bearing and operated by one motor. It produces vacuum on the system even when operating on float control.

Two pumps in one housing on one shaft, an air pump and a centrifugal pump for boiler feed, comprise the unit. Compactness and minimum floor space requirements are assured through the mounting of both motor and pump on interceptor base.

Ask for Bulletin No. 6 for full details of Skidmore Vacuum Pumps

SKIDMORE CORPORATION

General Offices and Factory: 1535 Dayton Street, Chicago

REPRESENTATIVES IN PRINCIPAL CITIES

Canadian Representatives: Darling Bros., Ltd., 120 Prince St., Montreal

Exhausting Corrosive Gases

CORROSIVE fumes are destructive to ordinary materials.

Coatings and linings on the exposed surfaces of exhaust fans handling such fumes give only temporary protection and require eternal vigilance.

Duriron fans, *solidly* resistant to acid fumes and the condensate formed, provide the permanent solution wherever such fumes must be exhausted.

These fans require no attention beyond an occasional oiling and may be operated at high speeds.

Acid-proof Duriron fans are extensively used in laboratories, battery stations, pickling and bright dip departments, chemical plants; in fact, wherever acid fumes must be efficiently exhausted.

Ask for bulletin No. 140-B.

THE DURIRON COMPANY
Incorporated
Dayton, Ohio

DURIRON
FOR ACID SERVICE

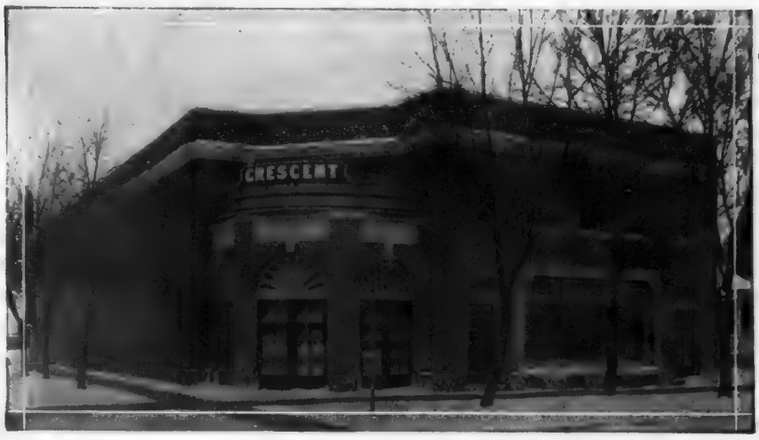
Specialization Cuts Costs

Job after job quoted on by our Manufacturing Department against our customers' own shops, shows we save them money on seamless tubing parts. Big volume, better equipment, specialized men—are the reasons.

We Want to Quote Where Quality Counts

WOLVERINE TUBE CO.
SEAMLESS COPPER BRASS & ALUMINUM
1415 Central Ave., Detroit, Michigan

Sales Offices: Cleveland; Chicago; Atlanta; Los Angeles; Denver; Dayton, Ohio; New York City; Dallas, Texas.

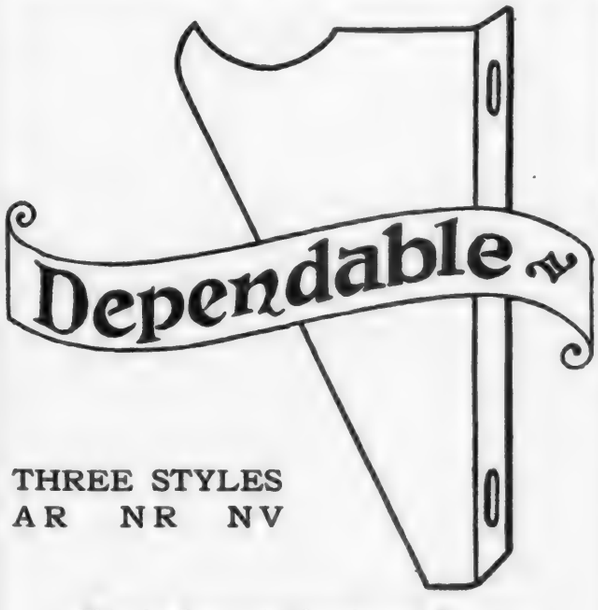


Johnston Steel Heating Boilers Making Good in Theatre Buildings

Johnston Steel Heating Boilers are the product of an organization that has been building good boilers for sixty-five years. Men who have grown up in the boiler business supervise each operation. Modern machinery assures quality and speed in production. Whether it is a theatre or any other type of building, there is a Johnston Steel Heating Boiler to meet your needs with efficiency and unusual economy. Be sure to get the Johnston Proposal before placing your order—it will pay you to do so. Write for Bulletin H-200.

JOHNSTON BROTHERS, Inc.
FERRYSBURG, MICHIGAN

HARTMANN RADIATOR BRACKETS

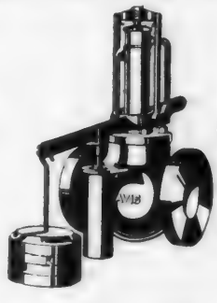


THREE STYLES
AR NR NV

Write for Descriptive Circular and Price List
CHARLES HARTMANN CO.
975-993 Dean Street BROOKLYN, N. Y.

VISIBLE ACTION

MEANS FOR HAND TESTING



There need never be any doubt about the working condition of a Davis Pressure Regulator. Its action is completely exposed to view and may be hand tested by merely lifting the weight beam. Know your equipment.

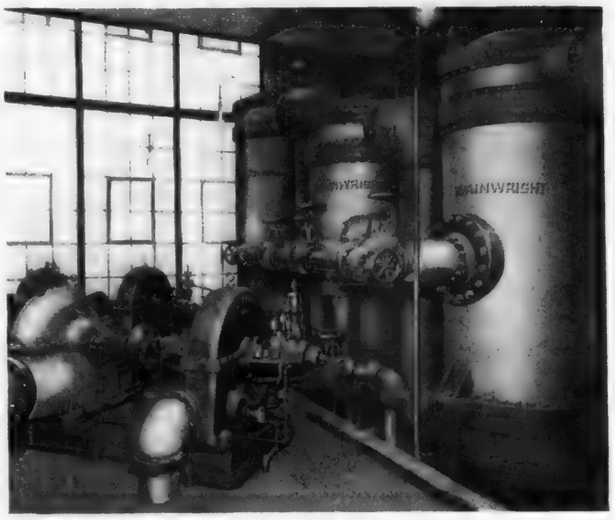
G. M. DAVIS REGULATOR CO.
436 Milwaukee Avenue, Chicago, Illinois

Balanced Valve Float Valve Steam Valve Back Pressure Valve
Stop and Check Valve Exhaust Relief Valve Non-Return Valve
Butterfly Valve Float Box with Control Valve

DAVIS AUTOMATIC VALVE SPECIALTIES

H&V8-Gray

Hot Water Heating Systems Using Exhaust Steam



Wainwright hot water heaters supplying heat to a group of buildings. Wainwright heaters are built in both vertical and horizontal types and either type may be installed, depending upon the space conditions.

The accompanying photograph shows three Wainwright hot water heaters used for heating a group of buildings. Each heater will raise the temperature of 1600 gals. of water per minute from 170 to 205 deg. F. when supplied with steam at 1 lb. gage pressure.

Comfortable room temperatures are provided by varying the heat in the entire heating system from the central power plant according to outside temperatures. Either exhaust or live steam may be supplied to the heaters.

FOSTER WHEELER CORPORATION
165 Broadway, New York, N. Y.
Branches in Principal Cities

Foreign Associates:—
Foster Wheeler Limited; London, England.
Societe Anonyme Foster Wheeler; Paris, France.
Foster Wheeler Limited; Toronto-Montreal-Vancouver, Can.

FOSTER WHEELER

NEWPORT MAGAZINE FEED BOILERS

. . . heat the easiest and cheapest way . . .

. . . . . and now is the time for you to capitalize on the rising tide of public demand for the Newport way of heating, a demand that has swept Newport sales to an increase of over 200% in the last four years. Concentrate on Newport—the better idea of heating—and 1929 will reward you well.

. . . . Get this
Newport Portfolio of dealer selling helps. Designed to help you get the cream of the business, it gives you all the data you need in compact and attractive form. Send for your portfolio now, it's free. Don't delay — it will open the doors to new and profitable business.

NEWPORT BOILER COMPANY
529 So. Franklin St.
Chicago, Ill.

Distributors in all principal cities—U. S. and Canada

FROST RESEARCH LABORATORY

A nationally recognized research service for the Heating and Ventilating Industry.

The Frost Research Laboratory
Incorporated
1326 MARKLEY STREET
Norristown Pennsylvania

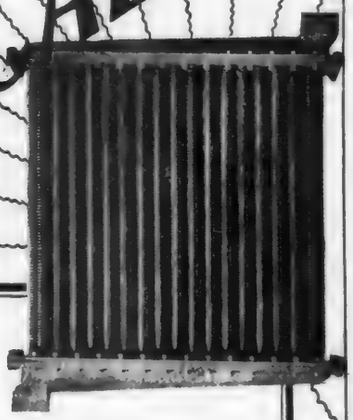
You are entitled

to a copy of this Atlas Junior Catalog No. 21. We have reserved a copy for every Heating and Ventilating Engineer. Want your copy? In which of the following are you interested?

- ☐ Reducing Valves
- ☐ Temperature Regulators
- ☐ Damper Regulators
- ☐ Pump Governors
- ☐ Float Valves
- ☐ Swing Joint Fittings
- ☐ Bronze Unions
- ☐ Thermostats
- ☐ Balanced Valves

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
281 South Street, Newark, N. J.

HELICALFIN



COPPER TUBE HEATERS

Engineering specifications that insure trouble-free service

1. Copper bearing boiler plate tube sheets
2. Heavy gauge seamless copper tubes
3. Tubes fused solidly to tube sheets—no soldered steam backed joints
4. Sturdy cast headers

Many other features.

Rome HELICALFIN Tubes and Heaters are used by nationally known makers of heating and ventilating equipment.

ROME-TURNEY RADIATOR CO.
ROME, N. Y.
Good Radiators since 1905.

TWINFAN
UNIT HEATERS

Give Better Heating Results

TYPE "D"

Twinfan Heater Type "D" unit, priced attractively, is of simple compact design. It is shipped as a complete unit, ready for quick and easy installation.

The fact that its two motors can be connected to separate switches for operation independently of each other, greatly increases the flexibility of control. With only one motor in operation the capacity of the unit is approximately 60% of the full rated capacity.

One of the various types of Twinfan Heaters will economically fit into any condition—for large or small spaces of any description.

DWYER EQUIPMENT CO.
4534 W. NORTH AVE. CHICAGO, ILL.
HEAT WITH TWINFAN UNIT HEATERS

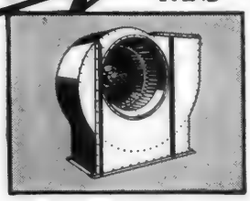
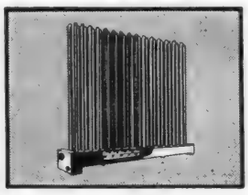
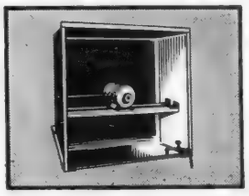
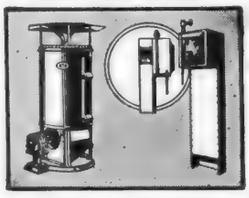
Frequently Bayley solves seemingly impossible problems in air engineering and equipment. Which is not to be considered remarkable, since this Company has been concerned with such problems for over 46 years . . . .

Is Your Bayley Library Complete? These valuable reference books will be mailed you on request:

Catalog No. 26— Plexiform Fans
Catalog No. 30— Chinook Heaters
Catalog No. 25— Turbo Air Washers
Catalog No. 32— Aerovane Blowers
Catalog No. H1— Unit Heaters
Catalog No. R1— Induced Draft
Catalog No. B— Exhaust Fans
Catalog No. LD— Leather Dryers

BAYLEY BLOWER COMPANY,
742 GREENBUSH ST., MILWAUKEE, WIS.
Representatives in Principal Cities

Bayley
Established 1883

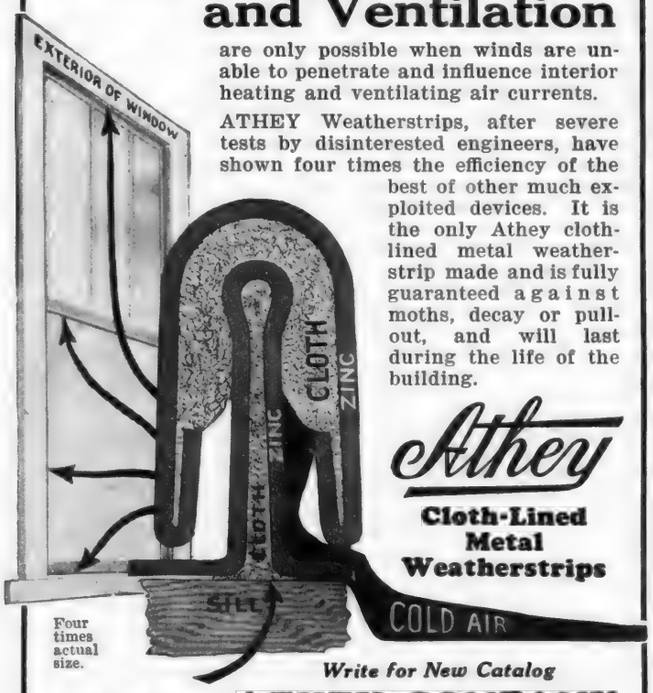
FANS 
HEATERS 
AIR WASHERS 
UNIT HEATERS 

HEATING — VENTILATING — AIR CONDITIONING — PROCESS DRYING — MECHANICAL DRAFT — EXHAUST

Controlled Heat and Ventilation

are only possible when winds are unable to penetrate and influence interior heating and ventilating air currents.

ATHEY Weatherstrips, after severe tests by disinterested engineers, have shown four times the efficiency of the best of other much exploited devices. It is the only Athey cloth-lined metal weatherstrip made and is fully guaranteed against moths, decay or pull-out, and will last during the life of the building.



Four times actual size.

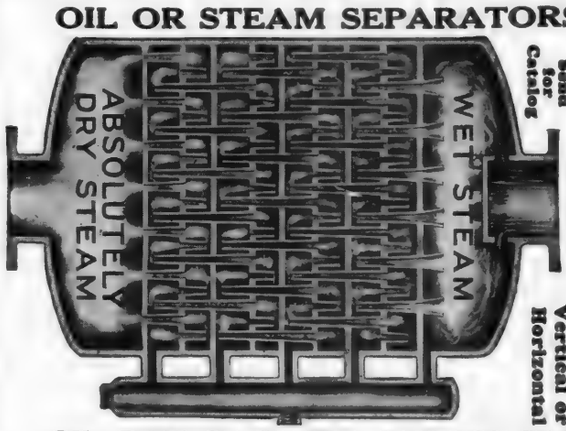
Athey
Cloth-Lined Metal Weatherstrips

Write for New Catalog

The best Heating Engineers plan for sufficient heat with a minimum fuel consumption by Atheyizing all windows of wood or steel.

ATHEY COMPANY
6087 W. 65th St. CHICAGO
Representatives in Principal Cities
In Canada:—Cresswell-Pomeroy Company, Montreal and Toronto

OIL OR STEAM SEPARATORS



FARNSWORTH COMPANY
CONSHOHOCKEN, PA.

OIL, DIRT OR WATER CAN NOT PASS

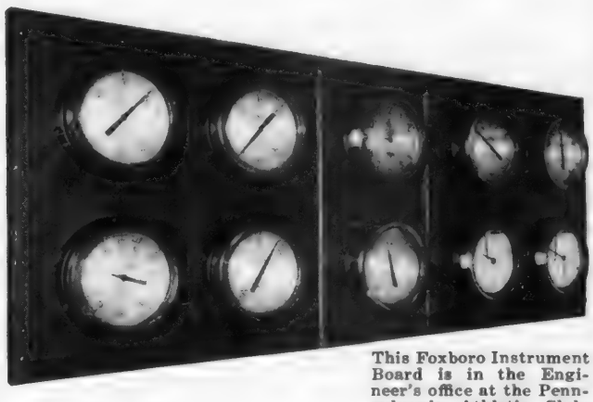
The Stoker-Unit Boiler

Originated and perfected by Oil City Boiler Works; fully protected by patents.

Can be operated *continuously* at 150% of rating, or as high as 200% for short periods.

Burns low-grade bituminous without smoke, complying with the strictest smoke-prevention ordinances.

Oil City Boiler Works
Oil City, Pa.



This Foxboro Instrument Board is in the Engineer's office at the Pennsylvania Athletic Club. It tells at a glance the vital facts of heating.

Where Heating Comfort is Stock in Trade

IN hotels, hospitals, clubs, theatres, and stores, heating comfort is a part of the service that *must* be rendered. For even *greater* comfort investigate Foxboro Instruments as a part of your regular heating equipment. By eliminating guesswork and substituting accurate knowledge of temperatures and pressures, these Instruments make possible a greater degree of heating comfort at a more economical cost.

Here are some users of Foxboro Instruments:

BOSTON FEDERAL RESERVE BANK
FIDELITY TRUST CO., PHILA.
FRANKFORT HEATING CO.
HUDSON'S BAY CO., WINNIPEG STORES
JOHN HANCOCK BLDG., BOSTON
PENNSYLVANIA ATHLETIC CLUB
PHILADELPHIA INQUIRER BLDG.
UNIVERSITY OF PENNSYLVANIA

Heating comfort means greater patronage. Greater patronage means more profits. For full information write the nearest Foxboro Branch Office.

THE FOXBORO COMPANY

Neponset Avenue,
FOXBORO, MASS., U. S. A.

New York, Detroit, San Francisco, Salt Lake City, Chicago, Cleveland, Dallas, Tulsa, Los Angeles, Philadelphia, Boston, Rochester, N. Y., Portland, Ore., Pittsburgh, Atlanta

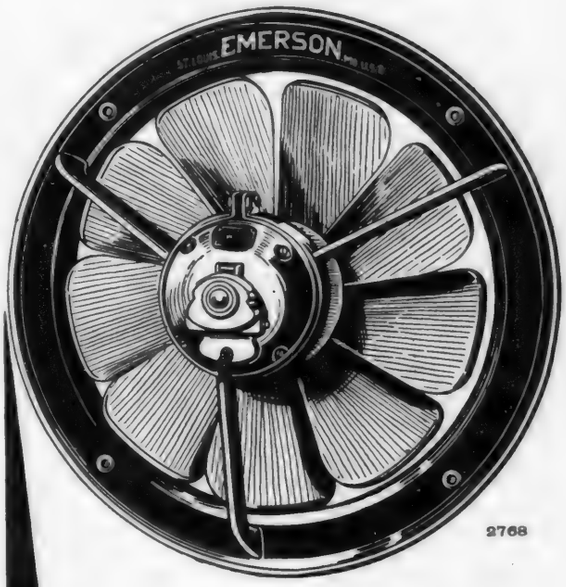
Australia—Alfred Snashall, Ltd., Sydney and Melbourne.

FOXBORO

REG. U. S. PAT. OFF.

THE COMPASS OF INDUSTRY

Instruments for Controlling, Recording and Indicating Temperature, Flow, Humidity and Pressure.



2768

BIGGER PROFITS

come from supplying equipment that satisfies, and therefore keeps your business building up . . . up . . . up . . .

If you haven't investigated the proposition on Emerson Exhausters, write us for full information today.

Discounts are liberal. And Emerson Exhausters satisfy every demand (1) because a trained factory consulting department is at your service to assist and advise in planning specific installation. (2) because Emerson Exhausters, with their famous Emerson Motor, sturdy construction and big air-moving capacity, supply the kind of efficient long time service that your customers want.

Full Details on Request

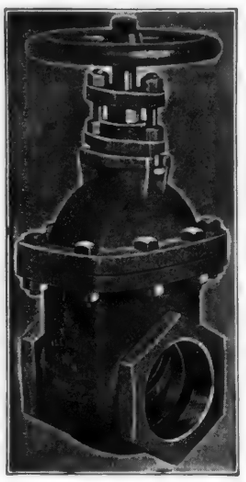
THE EMERSON ELECTRIC MFG. CO.
2018 Washington Ave., St. Louis, Mo.
806 W. Washington Blvd., Chicago, Ill.
50 Church Street, New York City

EMERSON EXHAUST FANS

12-16-18-24-30-36 inch sizes.

Made by the makers of Emerson Motors. 1/30 to 2 H.P. A.C. and D.C.

IRON BODY GATE VALVES



SCREWED, FLANGED
AND
HUB END STYLES

NON-RISING STEM
AND
O. S. and Y. PATTERNS

ALSO MANUFACTURERS OF
Cast and Malleable Iron Fittings
Brass Valves and Fittings

Illinois Malleable Iron Company

1801 Diversey Parkway :-: :-: Chicago, Ill.

Synonymous

↓ ↓ ↓

Barnes & Jones
and
QUALITY HEATING SYSTEMS

Barnes & Jones

128 Brookside Ave.
Jamaica Plain, Boston

101 Park Ave.
New York City

Modulation Vapor and Vacuum Heating Systems of Proven Quality

QUALITY

....combining the best of workmanship — the finest materials — with intelligent engineering practice and improved design, O. E. Frank equipment has yet to fail in meeting any specified engineering requirement.

OEF BUFFALO Olve E. Frank

FEED WATER HEATERS
HEAT RECLAIMERS
OIL COOLERS
HEAT EXCHANGERS
CONDENSERS

O. E. FRANK HEATER AND ENGINEERING COMPANY, Inc.
20 Milburn Street Buffalo, New York

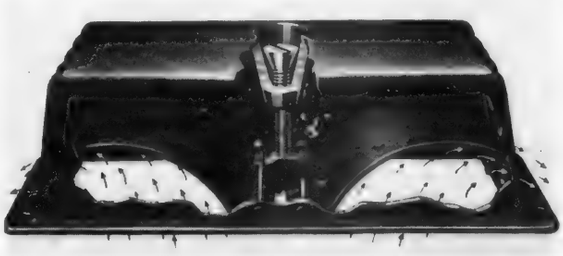
ROSS

Crosshead-
GUIDED
Expansion Joint
Excels in

Design, Construction and Workmanship
Over 60% of sales—Repeat Orders
Once Used—Always Demanded
Every Purchaser—A Customer

ROSS HEATER & MFG. CO., INC., BUFFALO, N. Y.

New York, Chicago, Philadelphia, Boston, Cleveland, St. Louis, Detroit, Pittsburgh, Baltimore, San Francisco, Seattle, Denver, Salt Lake City, Omaha, Montreal, Toronto.



(Patented)

ENFLO DIFFUSER

Insures Ample Fresh Air Circulation without Drafts

Even the finest assembly hall or auditorium is a complete failure unless it is well ventilated and without drafts. Enflo keeps air in constant circulation and at high velocity, but because the air current is parallel to the seats there is no draft at the feet.

Enflo is manufactured of cast iron of high quality and is built to stand the hardest possible wear. Since its mechanism is quite simple, it is easy to install and easier still to keep in order.

Illustrated Catalog mailed upon request

VENTILATING PRODUCTS CO.
2800 Cottage Grove Ave., Chicago, Ill.

Sheer Comfort=

Electric Room Temperature Control

Dealer's Price **$22.75**

Consumer's Price **$48.00** Installed

H. M. SHEER COMPANY
QUINCY Department HV ILLINOIS

CENTRAL STATION STEAM CO.

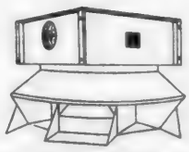
2912 East Woodbridge St.
DETROIT, MICHIGAN

MANUFACTURERS OF

Cadillac Condensation Meters
Detroit Feed Water Meters

Packingless Expansion Joints and other special fittings for underground steam distribution mains.

The Wing way is to distribute heat



Type LC unit for installation close to ceiling—widespread discharge from low levels. Also used with fresh air duct.

There's a lot more to overhead heating than just blowing down hot air.

EVERYBODY admits that the old wall coil-type heater in industrial buildings is out; but it doesn't follow that any heater is good because it blows hot air around. All really efficient unit heaters are ENGINEERED into buildings to DISTRIBUTE heat by diffusing currents of warm air through the rest of the air to be heated.

Wing Featherweight Unit Heaters owe their success to the thorough way they distribute heat. They are built to direct large quantities of warm air downward in all directions at a high enough velocity for the currents to be deflected and yet penetrate the cooler air beneath, spreading warmth throughout the building.

The special features that account for the Wing's unusual effectiveness are:

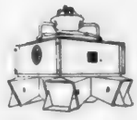
1. Their position directly overhead giving downward discharge in all directions;

2. Their lightness that permits location just where they will be most effective;

3. Their efficient Scruplex propeller-type fan providing warm air currents of the proper volume and velocity;

4. Their variety of specially engineered discharges making it possible to secure the right angle of deflection for structures of various heights and shapes.

Our new catalog shows graphically how you can engineer a Wing Heating System into any type of building. Write us for it.



Widespread discharge in all directions

For high locations over square areas

Moderate heights. Square areas

Moderate heights. Long, narrow areas

For high locations. Long, narrow areas

L. J. WING MFG. COMPANY
Dept. 8
158 West 14th Street
New York City, N. Y.

WING FEATHERWEIGHT UNIT HEATERS

MANUFACTURED WEATHER

Carrier
AIR CONDITIONING
DRYING
REFRIGERATION

makes

"Every day a *good* day"
Air Conditioning

Humidification, Dehumidification
Centrifugal Refrigeration
Cooling of Public and Industrial Buildings
Temperature and Humidity Control

DRYING AND PROCESSING

Carrier Engineering Corporation

Offices and Laboratories
NEWARK, NEW JERSEY

SALES OFFICES

New York Philadelphia
Boston Chicago
Cleveland Detroit
Washington
Kansas City
Los Angeles

See our detailed data in A. S. H. & V. E. Guide.

Literature on request. Write concerning your specific problem.

Easy to Install

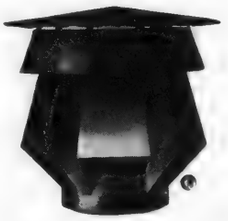
The
GORTON
Single Pipe
Vapor System

At last—here is a vapor system that will not only do the work but also is one that is extremely simple. This fact is one of the big secrets of the Gorton System's success.

Write and ask us to tell you about it in detail

GORTON HEATING CORPORATION
Manufacturers—Est. 1887
96 Liberty Street • • New York City

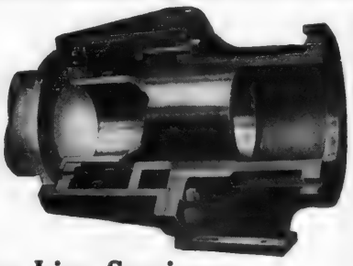
Specify ÆOLUS IMPROVED VENTILATORS



Aeolus Improved Ventilators are supplied in fourteen different metals to meet the conditions encountered.

AEOLUS DICKINSON
Industrial Division of Paul Dickinson, Inc.
3340 S. Artesian Ave.
Chicago, Ill.

HOWARD Guided Expansion Joint



For Pipe Line Service

Eliminates trouble from Expansion and Contraction, saves space, labor and repair bills; the construction is mechanically correct.

ALBERGER HEATER CO. **285 Chicago St.**
HOWARD IRON WORKS **Buffalo, N. Y.**

THERMOSTATIC METAL

The most accurate, constant and durable of expansion units

FOR LOW AND HIGH TEMPERATURES

Our No. 1800 metal for temperatures below 350° F.
Our No. 2800 metal for temperatures below 1500° F.

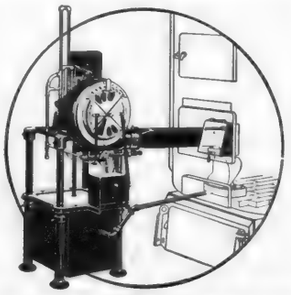
Positive and Dependable Thermostatic Metals

W. M. CHACE VALVE COMPANY
1600 Beard Avenue
Detroit, Michigan

Continuous Flame

No Gas Pilot
No Electric Ignition

Distributors
Write for the McIlvaine Sales Plan



McILVAINE OIL BURNER
Listed by Underwriters

Dependable Heat

Graduated Automatic Control
Mechanical Draft

McILVAINE BURNER CORPORATION
Dept. H 745 Custer Ave.
EVANSTON, ILLINOIS

The TooPas Air Filter
cleans the air twice

BASED on the time tested principles of the Phoenix filter, the new TooPas insures high cleaning efficiency and the elimination of oil entrainment. Sectional construction fits any wall opening. *Send for the Bulletin.*

NATIONAL AIR FILTER COMPANY

205 Central Ave. Louisville, Ky.

THE AIRMASTER

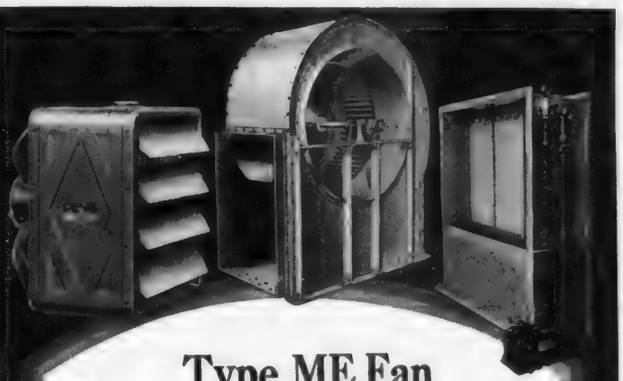
REG. U. S. PAT. OFF.

Note the Hump on the Blade* . . . .

Airmaster moves more air with less effort because the air thrust is practically equally distributed. Airmaster's shorter blades have less vibrating resonance; its design reduces air friction and resistance. Result: larger air capacity, less power consumption, silent operation. What more could you want of any ventilating fan? Ask for details.

AIRMASTER CORPORATION
140 South Dearborn Street - Chicago, Ill.

*There's the secret of Airmaster's greater volume of air delivery. Airmaster exhaust fans with 16-inch or 18-inch Airmaster propellers will assure the same efficiency as an 18-inch or 20-inch propeller of the ordinary type.



Type ME Fan
Comet Unit Heaters
Peerless Air Washers

Catalogs or bulletins on the above contain data of value to those who have to do with the heating, ventilating or air conditioning of buildings of any type. Copies of any or all will be sent upon request to 3151 Shields Avenue, Chicago.

The NEW YORK BLOWER COMPANY

Two New Bulletins

Two new bulletins describing Metaphram Damper Regulators have been prepared for distribution to the trade.

Bulletin LP-100 describes Metaphram Damper Regulators for low pressure boilers—steam, vapor or vacuum.

Bulletin F-100 describes the Type "F" Metaphram Damper Regulator for hot water boilers and domestic water heaters.

Heating contractors desirous of furnishing the most sensitive damper control it is possible to secure on boilers of their installation will be interested in the information contained in these bulletins.

New features of construction are shown that increase sensitivity; reduce friction and eliminate binding in the lever movement, permitting a freer transmission of power developed by the Metaphram units to operation of draft and check dampers.

Copies of either or both of these bulletins will be mailed on request. Just check and sign the coupon.

NATIONAL REGULATOR CO.
2309 Knox Avenue Chicago, Ill.

NATIONAL

National Systems of Heat Regulation and Humidity Control, Metaphram Dampers, Metaphram Motors, Industrial Thermostatic Devices, A-Jacks Steam Damper Regulator for high pressure boilers, Metaphram Damper Regulators for domestic steam, vapor, vacuum and hot water heating boilers, Metaphram Furnace Regulators.

METAPHRAM

NATIONAL REGULATOR CO., 2309 Knox Ave., Chicago

Send us ☐ Bulletin LP-100; ☐ Bulletin F-100.

Name.....

Address.....

Town..... State.....

ENGINEERS' SPECIFICATION INDEX

ACID FUME EXHAUSTERS
Duriron Company, Inc., The, Dayton, O.

AIR COMPRESSORS
Bishop & Babcock Sales Co., Cleveland, Ohio.
Economy Pumping Machinery Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Nash Engineering Co., So. Norwalk, Conn.
Powers Regulator Co., Chicago, Ill.

AIR CONDITIONING APPARATUS
Air Filtration Co., New York.
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
Midwest Air Filters, Inc., Bradford, Pa.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
U. S. Ozone Corp., Scottdale, Penn.
Vilter Mfg. Co., Milwaukee, Wis.
Woodward Co., Frank E., Boston, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

AIR COOLING & DRYING SYSTEMS
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
Johnson Service Co., Milwaukee, Wis.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.

AIR ELIMINATORS
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York.
Hoffman Specialty Co., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

AIR FILTERS
Air Filtration Co., New York.
American Blower Co., Detroit, Mich.
Midwest Air Filters, Inc., Bradford, Pa.
National Air Filter Co., Chicago, Ill.
Staynew Filter Corp., Rochester, N. Y.

AIR SEPARATORS
Bishop & Babcock Sales Co., Cleveland, Ohio.
Swartwout Co., Cleveland, Ohio.

AIR WASHERS
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
New York Blower Co., Chicago, Ill.

BELTING
Alexander Bros., Inc., Philadelphia, Pa.

BLOWERS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Garden City Fan Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

BOILERS, COPPER
Badger & Sons Co., E. B., Boston, Mass.

BLOWERS, FAN
(See Fans, Supply & Exhaust).

BOILERS, HEATING, CAST-IRON, COAL BURNING
American Radiator Co., New York.
Burnham Boiler Corp., Irvington, N. Y.
Combination Boiler Co., Benton Harbor, Mich.
Illinois Malleable Iron Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Newport Boiler Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Weil-McLain Co., Chicago, Ill.

BOILERS, HEATING, DOWN-DRAFT, COAL BURNING
American Radiator Co., Buffalo, N. Y.
Brownell Co., The, Dayton, Ohio.
International Boiler Works, East Stroudsburg, Pa.
Kewanee Boiler Corp., Kewanee, Ill.
National Radiator Corp., Johnstown, Pa.
Oil City Boiler Wks., Oil City, Pa.
Orr & Sembower Co., Reading, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corporation, Cincinnati, O.
Titusville Iron Wks. Co., Titusville, Pa.

BOILERS, HEATING, GAS-FIRED
American Gas Products Corp., New York
American Radiator Co., Buffalo, N. Y.
International Boiler Works, E. Stroudsburg, Pa.
Frost Mfg. Co., Galesburg, Ill.
National Radiator Corp., Johnstown, Pa.
Orr & Sembower Co., Reading, Pa.
Stanwood Corporation, Cincinnati, O.
Triple Duty Boiler Co., Detroit, Mich.

BOILERS, HEATING, MAGAZINE FEED
Gorton Heating Corporation, New York.
Newport Boiler Co., Chicago, Ill.
Orr & Sembower Co., Reading, Pa.

BOILERS, HEATING, OIL-FIRED
Bryan Steam Corp., Peru, Ind.
Combination Boiler Co., Benton Harbor, Mich.
International Boiler Works, E. Stroudsburg, Pa.
Johnston Bros., Inc., Ferrysburg, Mich.
Monitor Boiler Co., Philadelphia, Pa.
Triple Duty Boiler Co., Detroit, Mich.

BOILERS, HEATING, STEEL, COAL-FIRED
Brownell Co., The, Dayton, Ohio.
Coatesville Boiler Works, Coatesville, Pa.
Combination Boiler Co., Benton Harbor, Mich.
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Gorton Heating Corp., New York.
International Boiler Works, East Stroudsburg, Pa.
Heggie-Simplex Boiler Co., Joliet, Ill.
Johnston Bros., Inc., Ferrysburg, Mich.
Kewanee Boiler Corp., Kewanee, Ill.
Monitor Boiler Co., Philadelphia, Pa.
Oil City Boiler Wks., Oil City, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Stanwood Corporation, Cincinnati, O.
Triple Duty Boiler Co., Detroit, Mich.

BOILERS, POWER
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Oil City Boiler Wks., Oil City, Pa.
Stanwood Corporation, Cincinnati, O.
Titusville Iron Wks. Co., Titusville, Pa.

CALORIMETERS
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.

CIRCULATORS, WATER
Janette Mfg. Co., Chicago, Ill.
Rochester Circulator Mfg. Co., Rochester, N. Y.

COILS, PIPE
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Crane Co., Chicago, Ill.
Foster Wheeler Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

CONDENSERS
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

CONDUITS, UNDERGROUND PIPE
American District Steam Co., North Tonawanda, N. Y.
Ric-wiL Co., The, Cleveland, Ohio.

CONVERTERS, HOT WATER
Davis Engineering Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLERS, AIR
Alberger Heater Co., Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.

COOLERS, OIL
Davis Engineering Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING TOWERS & PONDS
Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Foster Wheeler Corp., New York.
General Air Filters Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

COVERING, BOILER, PIPE, ETC.
American District Steam Co., North Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Ric-wiL Co., The, Cleveland, Ohio.

DAMPER REGULATORS
(See Regulators, Damper).

DAMPERS, DUCT

DEHUMIDIFYING APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
Johnson Service Co., Milwaukee, Wis.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Philadelphia, Pa.

DISTILLERS (WATER)
Badger & Sons Co., E. B., Boston, Mass.
Davis Engineering Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

DRAFT APPLIANCES, MECHANICAL
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

DRYING SYSTEMS
(See Air Cooling & Drying Systems).

DUST COLLECTING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
General Air Filters Corp., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.

DUST COLLECTORS
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

ENGINES, STEAM
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
Stanwood Corp., Cincinnati, O.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EQUALIZING LOOPS
Hoffman Specialty Co., New York.
Sarco Co., Inc., New York.

EVAPORATORS, BOILER FEED MAKE-UP
Buffalo Forge Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

EXHAUST HEADS
Aeolus Dickinson, Chicago, Ill.
Crane Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Swartwout Co., Cleveland, Ohio.

EXHAUST SYSTEMS
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

EXHAUST SYSTEMS, ACID
Duriron Co., Inc., The, Dayton, O.

EXPANSION JOINTS
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Crane Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Walworth Co., New York.
Webster & Co., Warren, Camden, N. J.

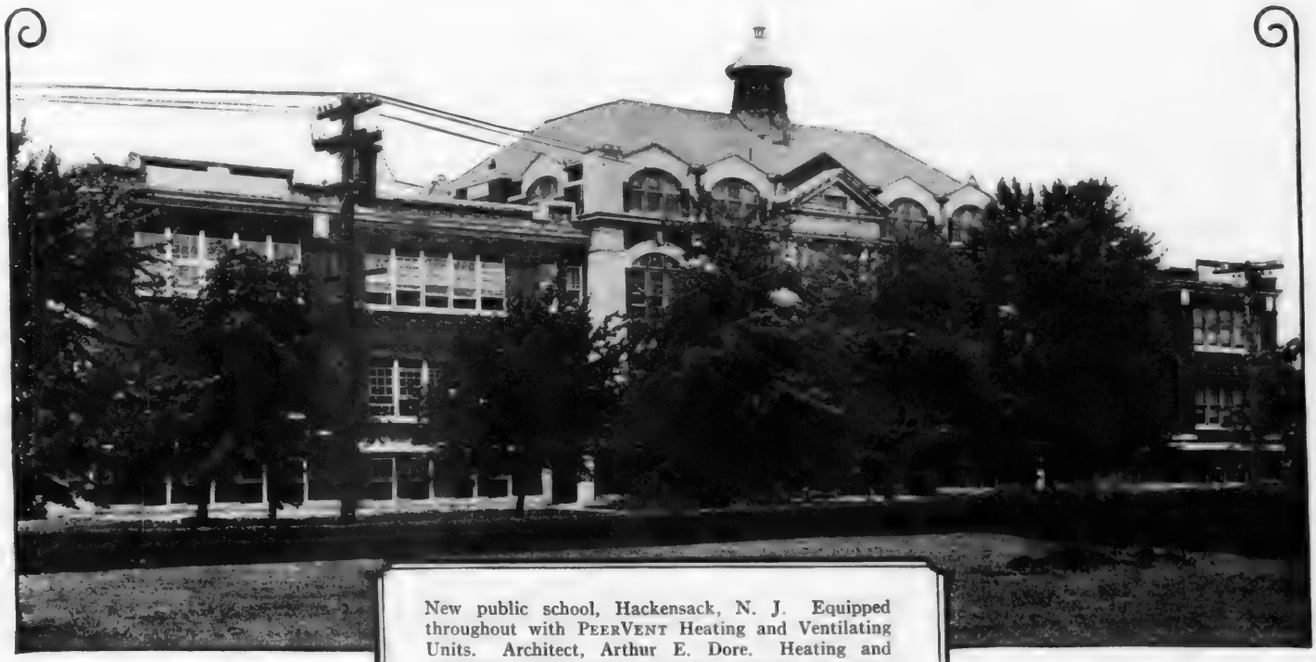
EXPANSION SHELLS
Phillips Drill Co., Chicago, Ill.

EXPOSITION
International Heating & Ventilating Exposition, Philadelphia, Pa.

FANS, CENTRIFUGAL
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Garden City Fan Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FANS, DISC
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FANS, PROPELLER
Airmaster Corp., Chicago, Ill.
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Emerson Electric Mfg. Co., St. Louis, Mo.
Hartzell Propeller Co., Piqua, Ohio.
Modine Mfg. Co., Racine, Wis.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
Young Radiator Co., Racine, Wis.



New public school, Hackensack, N. J. Equipped throughout with PEERVENT Heating and Ventilating Units. Architect, Arthur E. Dore. Heating and Ventilating Contractors, Daniel McGrath Company.

1914 1929

A public school in Hackensack, N. J., built in 1914, was equipped throughout with PEERLESS Heating and Ventilating Units.

A new Hackensack school building, recently completed, is equipped with our improved PEERVENT Heating and Ventilating Units.

Repeat orders like this one, over a period of fifteen years, are proof of satisfactory service.

PEERLESS Units installed eighteen years ago are still giving perfect satisfaction. The improved PEERVENT Unit of to-day is backed by forty years of specialized experience in heating and ventilation.

PEERLESS UNIT VENTILATION CO., Inc.
Pioneers in Unit Ventilation
BRIDGEPORT, CONNECTICUT
Selling Agents in Principal Cities from Coast to Coast.

PEERVENT

HEATING AND VENTILATING UNITS

FANS, MULTI-BLADE
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Garden City Fan Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FANS, STEEL PLATE
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Garden City Fan Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

FEEDERS, BOILER
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Walworth Co., New York.

FILTERS, (AERATING)
Davis Engineering Corp., New York.

FILTERS, FEED-WATER
Davis Engineering Corp., New York.

FITTINGS, ACID RESISTING
Crane Co., Chicago, Ill.
Duriron Co., Inc., The, Dayton, O.

FITTINGS, PIPE, FLANGED
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York.

FITTINGS, PIPE, SCREWED
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York.

FLANGES
Crane Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Walworth Co., New York.

GAS BURNERS
Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.
General Gas Light Co., Kalamazoo, Mich.

GAS BURNERS (CONVERSION TYPE)
Columbia Burner Co., Toledo, Ohio.

GASKETS, ASBESTOS
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GASKETS, METALLIC
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GASKETS, RUBBER
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GAUGE BOARDS
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGE GLASSES
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GAUGES, ALTITUDE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.

GAUGES, DRAFT
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro, Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, HYDRAULIC
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

GAUGES, OUNCE GRADUATED
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol, Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

GAUGES, PRESSURE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

GAUGES, TANK
King-Seeley Corp., Ann Arbor, Mich.

GAUGES, VACUUM
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, VACUUM (COMPOUND)
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, WATER
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

GENERATOR COOLING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

GOVERNORS (PUMP)
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Webster & Co., Warren, Camden, N. J.

GRATES, DUMPING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Stanwood Corp., Cincinnati, Ohio.

GRATES, ROCKING
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING AND DUMPING
Frost Mfg. Co., Galesburg, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING, CIRCULAR
Fitzgibbons Boiler Co., Inc., New York.

GRATES, STATIONARY
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Stanwood Corp., Cincinnati, Ohio.

HEAT CABINETS
(See Radiators, Cabinet and Concealed)

HEATERS, AIR, FAN SYSTEM
Aerofin Corp., Newark, N. J.
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Rome-Turney Radiator Co., Rome, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
Young Radiator Co., Racine, Wis.

HEATERS, DOMESTIC WATER
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Crane Co., Chicago, Ill.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Modine Mfg. Co., Racine, Wis.
Monitor Boiler Co., Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Weil-McLain Co., Chicago, Ill.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, ELECTRICAL UNIT
American Blower Co., Detroit, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.

HEATERS, FEED WATER, (CLOSED)
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Stanwood Corp., Cincinnati, Ohio.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, FEED WATER (OPEN)
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Stanwood Corp., Cincinnati, Ohio.
Webster & Co., Warren, Camden, N. J.

HEATERS, FUEL-OIL
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Electrol, Inc., St. Louis, Mo.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Air Filter Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, UNIT
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Philadelphia, Pa.
Young Radiator Co., Racine, Wis.

HEATING SYSTEMS, VACUUM
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago Ill.
McAlear Mfg. Co., Chicago, Ill
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, VAPOR
American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, WATER
American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Grinnell Co., Providence, R. I.
Hornung, J. C., Chicago, Ill.
Mueller Co., Decatur, Ill.
Page Boiler Co., Wm., H., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y

HUMIDIFIERS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

HUMIDITY CONTROL
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.

INSTRUMENTS, ELECTRIC MEASURING
Bristol Co., The, Waterbury, Conn.

INSTRUMENTS, INDICATING AND RECORDING
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

Wilcox

Safety-Vent Vapor Regulator

POWER IS ITS MIDDLE NAME

Makes any Vapor or Modulating System safe and satisfactory. Sensitive to the slightest change in pressure. Has ample power to control the dampers with a good working margin.

Full power of regulator is exerted within a pressure range of two or three ounces.

The Safety Vent Valve is a distinguishing feature of this regulator and takes care of air from entire heating system.

Tested and carefully adjusted before leaving factory, ready to be connected up and put into service, with the least trouble and expense.

All working parts of cast bronze. Will last as long as the boiler, or any other part of system.

Write for details

SIMPLEX HEATING SPECIALTY COMPANY, Inc.
LYNCHBURG, VA.

PRICED RIGHT

A dollar's worth for every dollar you spend. That's what you get in Swartwout Steam Products. Ask for complete catalog.

THE SWARTWOUT COMPANY
18511 Euclid Avenue
Cleveland, Ohio

Swartwout Steam Products

No. 0 THERMOFLEX BLAST AND DRIP TRAP

Especially designed for dripping large supply mains, hot water heaters, unit heaters, etc. A small combination float and thermostatic trap. Self-supporting in the pipe line. Small, compact, and very efficient in operation. Low in cost, high in quality.

Send for Bulletin No. 52 A.

W. D. CASHIN COMPANY
35 HARTFORD ST., BOSTON, MASS.

INSULATION, BOILER, PIPE, ETC.
(See Covering, Boiler, Pipe, etc.)

INSULATION, BUILDING
Celotex Co., Chicago, Ill.
Flax-li-num Insulating Co., St. Paul, Minn.
Insulite Co., Minneapolis, Minn.

KETTLES, COPPER
Badger & Sons Co., E. B., Boston, Mass.

MANOMETERS
American Blower Co., Detroit, Mich.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.

MECHANICAL DRAFT APPLIANCES
(See Draft Appliances, Mechanical)

METALS, THERMOSTATIC
Chace Valve Co., W. M., Detroit, Mich.

METERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.

METERS, FEED WATER
Central Station Steam Co., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

METERS, FLOW
Foxboro Co., Inc., The, Foxboro, Mass.

METERS, PITOT TUBE
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.

METERS, STEAM
American District Steam Co., North Tonawanda, N. Y.

MOTORS (ELECTRIC)
Baldor Electric Co., St. Louis, Mo.
Century Electric Co., St. Louis, Mo.
Crocker-Wheeler Electric Mfg. Co.
Emerson Electric Mfg. Co., St. Louis, Mo.
Janette Mfg. Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

NOZZLES, ACID RESISTING
Duriron Co., Inc., The, Dayton, O.

NOZZLES, SPRAY
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

OIL BURNERS
Electrol Inc., St. Louis, Mo.
Hardinge Bros., Inc., Chicago, Ill.
Johnson Co., S. T., Oakland, Cal.
May Oil Burner Co., Baltimore, Md.
McIlvaine Burner Corp., Chicago, Ill.
Preferred Oil Burners, Inc., Peoria, Ill.
Winslow Boiler & Eng. Co., Chicago, Ill.

OIL BURNER EQUIPMENT
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Hornung, J. C., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Schutte & Koerting Co., Philadelphia, Pa.

OIL BURNER IGNITION AND CONTROL EQUIPMENT
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Penn Electric Switch Co., Des Moines, Iowa.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
White Mfg. Co., St. Paul, Minn.

OZONE APPARATUS
United States Ozone Co. of America, Scottdale, Pa.

PIPE, ACID-RESISTING
Duriron Co., Inc., The, Dayton, O.

PIPE BENDING
Badger & Sons Co., E. B., Boston, Mass.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (WOOD)
American District Steam Co., North Tonawanda, N. Y.

PIPE, CAST-IRON
American Radiator Co., New York.

PIPE HANGERS
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Walworth Co., New York.

PIPE THREADING & CUTTING MACHINES
Crane Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.

PIPE, STEEL
Crane Co., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.

PRESSURE REDUCING VALVES
(See Regulators, Pressure).

PULLEYS, VARIABLE SPEED

PUMPS, ACID RESISTING
Duriron Co., Inc., The, Dayton, O.

PUMPS, CENTRIFUGAL
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, CENTRIFUGAL, VACUUM HEATING
Ames Pump Co., New York.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

PUMPS, CONDENSATION
American Steam Pump Co., Battle Creek, Mich.
Ames Pump Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

PUMPS, OIL
Janette Mfg. Co., Chicago, Ill.

PUMPS, RECIPROCATING STEAM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.

PUMPS, SUMP
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, TURBINE
Foster Wheeler Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, VACUUM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

RADIATOR ENCLOSURES AND SHIELDS
American Metal Products Corporation, St. Louis, Mo.

RADIATOR HANGERS
American Radiator Co., Buffalo, N. Y.
Grinnell Co., Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Co., St. Paul, Minn.
Kewanee Boiler Corp., Kewanee, Ill.
McAlear Mfg. Co., Chicago, Ill.

RADIATORS, CABINET AND CONCEALED
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Rome Brass Radiator Corp., New York.
Shaw-Perkins Mfg. Co., Pittsburgh, Pa.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Young Radiator Co., Racine, Wis.

RADIATORS, CAST-IRON
American Radiator Co., Buffalo, N. Y.
Burnham Boiler Corp., Irvington, N. Y.
Crane Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Modine Mfg. Co., Racine, Wis.
National Radiator Corp., Johnstown, Pa.
Nelson Corp., Herman, The, Moline, Ill.
Page Boiler Co., Wm. H., New York.
U. S. Radiator Corp., Detroit, Mich.

RADIATORS, GAS HEATED
General Gas Light Co., Kalamazoo, Mich.

RECEIVERS, AIR
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

RECEIVERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

REFRIGERATING APPARATUS
Vilter Mfg. Co., Milwaukee, Wis.

REGULATORS, BOILER-FEED
Atlas Valve Co., Newark, N. J.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.

REGULATORS, DAMPER
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Atlas Valve Co., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corp., New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicgao, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Temperature Control Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
White Mfg. Co., St. Paul, Minn.
Wing Mfg. Co., L. J., New York.

REGULATORS, PRESSURE
American District Steam Co., North Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kainer & Company, Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mueller Co., Decatur, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

REGULATORS, TEMPERATURE
(See Temperature Control)

SEPARATORS, OIL
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster & Co., Warren, Camden, N. J.

SEPARATORS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
Illinois Engineering Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Swartwout Co., Cleveland, Ohio.
Webster & Co., Warren, Camden, N. J.

SPRAY COOLING SYSTEMS
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

SPRAY NOZZLES
(See Nozzles, Spray)

STERILIZER, WATER
U. S. Ozone Corp., Scottdale, Penn.

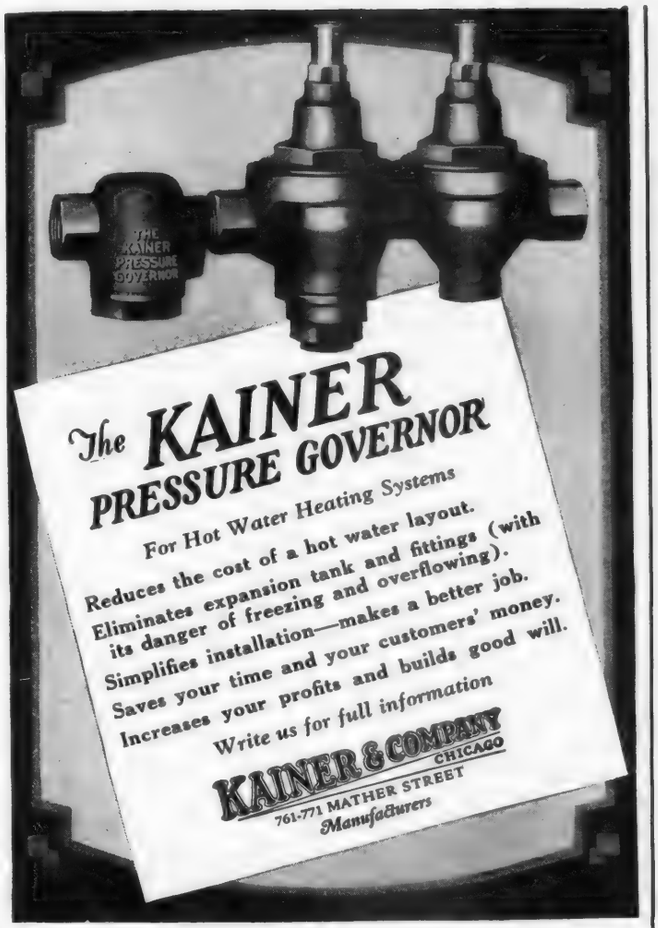
STOKERS, MECHANICAL
Brownell Co., Dayton, Ohio.
Domestic Stoker Co., New York.
Fire-King Stoker Co., Indianapolis, Ind.
General Stoker Corp., New York.

STRAINERS, OIL
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, WATER
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

TEMPERATURE CONTROL
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Penn Electric Switch Co., Des Moines.
Raymond, F. I., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
Trane Co., The, LaCrosse, Wis.
White Mfg. Co., St. Paul, Minn.



The KAINER PRESSURE GOVERNOR

For Hot Water Heating Systems

Reduces the cost of a hot water layout.
Eliminates expansion tank and fittings (with its danger of freezing and overflowing).
Simplifies installation—makes a better job.
Saves your time and your customers' money.
Increases your profits and builds good will.

Write us for full information

KAINER & COMPANY
CHICAGO
761-771 MATHER STREET
Manufacturers

HEAT — HUMIDITY

The Thermoist Unit

A combined heater and humidifier. It is easy to install in new or old houses. Nothing shows but the grille, yet every part is accessible. The simplest method of concealing the radiator in first floor rooms and at the same time supply automatically the right amount of moisture for the entire house.

Proper humidity means Comfort — Health — Economy.

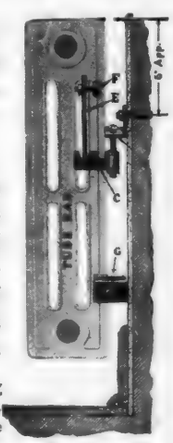
Manufactured by

FRANK E. WOODWARD CO.
19 FRIEND ST. BOSTON, MASS.

Modernize Your Radiator Installations

You can with the new, improved E-Z Hanger. Unexcelled in its ability to give you, easily and quickly, radiator installation jobs you will be justly proud of. Better looking—modern—sanitary.

The E-Z Radiator Hanger is suitable both for wall and tube type radiators. No need for accurate measurements of anchor bolts. Height and lateral variations taken care of. No obstruction of any kind back of radiator. Hanger out of sight. Adapted to any wall material.



Style C

Architects and contractors recommend the E-Z Radiator Hanger. In wide use in homes, office buildings, hospitals, schools and public buildings. Large stocks in all principal cities. Write for particulars.

EZ RADIATOR HANGER

Made by
HEALY-RUFF COMPANY
784 Hampden Avenue
ST. PAUL, MINN.

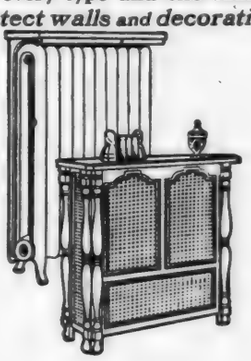
Also Manufacturers of
EZ INSERT

KAUFFMAN RADIATOR SHIELDS AND ENCLOSURES

ANY FINISH ANY PERIOD

For every type and size radiator

Protect walls and decorations



Heating Contractors

recognize the value of this line which can usually be sold when the original contracts for new work are signed. In slack seasons, gives salesmen something to work with on older installations.

Some prime territory still open. Don't pass up this opportunity of adding a sales-builder to your line.

American Metal Products Corp.
8500 N. Goodfellow Avenue, ST. LOUIS, U.S.A.

THERMOMETERS, RECORDING AND INDICATING

American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bristol Co., The Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.

THERMOSTATS

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.
White Mfg. Co., St. Paul, Minn.

TRAPS, BUCKET

Crane Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Swartwout Co., Cleveland, Ohio.
Trerice Co., H. O., Detroit, Mich.

TRAPS, FLOAT

Crane Co., Chicago, Ill.
General Air Filters Corp., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York.
Swartwout Co., Cleveland, Ohio.

TRAPS, FLOAT & THERMOSTATIC

Dunham Co., C. A., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.

TRAPS, INVERTED BUCKET (STEAM AND AIR)

Armstrong Machine Wks., Three Rivers, Mich.

TRAPS, LIFTING

Crane Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Swartwout Co., Cleveland, Ohio.

TRAPS, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
Armstrong Machine Wks., Three Rivers, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, RETURN

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, STEAM

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Connor Co., Inc., The W. B., New York.
Crane Co., Chicago, Ill.
Davis Engineering Corp., New York.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Trerice Co., H. O., Detroit, Mich.

TRAPS, VACUUM

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TUBING, COPPER AND BRASS

Crane Co., Chicago, Ill.
Wolverine Tube Co., Detroit, Mich.

TURBINES, STEAM

Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

TURBO-BLOWERS

Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

UNIT HEATERS

(See Heaters, Unit)

VACUUM CLEANING APPARATUS

American Radiator Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VALVES, ACID RESISTING

Crane Co., Chicago, Ill.
Duriron Co., Inc., The, Dayton, O.

VALVES, AIR, AUTOMATIC

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm., H., New York.
Powers Regulator Co., Chicago, Ill.

VALVES, AIR RELIEF

American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Gorton Heating Corp., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
Trane Co., The, LaCrosse, Wis.

VALVES, BACK PRESSURE

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, BALANCED

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

VALVES, BLOW-OFF

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Lytton Mfg. Corp., Franklin, Va.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, CHECK

Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, FLOAT

Atlas Valve Co., Newark, N. J.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.

VALVES, GATE

American District Steam Co., North Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, GLOBE, ANGLE & CROSS

Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, HYDRAULIC-OPERATING

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Walworth Co., New York.

VALVES, MAGNETIC

Time-O-Stat Controls Co., Elkhart, Ind.

VALVES, NON-RETURN

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corp., New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Walworth Co., New York.
Webster & Co., Warren, Camden, N. J.

VALVES, PRESSURE REDUCING

(See Regulators, Pressure)

VALVES, REGULATING

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kainer & Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Walworth Co., New York.

VALVES, RELIEF (WATER)

American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Kainer & Co., Chicago, Ill.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Radiator Corp., Johnstown, Pa.

VALVES, SAFETY

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Div., Consolidated Ashcroft Hancock Co., Inc., Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.
Walworth Co., New York.

VALVES, STOP AND CHECK

(See Valves, Non-Return).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
American Radiator Co., Buffalo, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
Nelson Corp., Herman, The, Moline, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

VENTILATING SYSTEMS, ACID

Duriron Co., Inc., The, Dayton, O.

VENTILATORS

Bayley Blower Co., Milwaukee, Wis.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATORS, FLOOR

Aeolus Dickinson, Chicago, Ill.
American Blower Co., Detroit, Mich.
American Metal Products Corporation, St. Louis, Mo.
Buffalo Forge Co., Buffalo, N. Y.
Knowles Mushroom Ventilator Co., New York.
Ventilating Products Co., Chicago, Ill

VENTILATORS, ROOF

Aeolus Dickinson, Chicago, Ill.

VENTILATORS, UNIT

American Blower Co., Detroit, Mich.
Nelson Corp., Herman, The, Moline, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

WATER STERILIZERS

Clow Co., Jas. B., Chicago, Ill.

WEATHER STRIPS, METAL

Athey Co., Chicago, Ill.

WRENCHES, STILLSON

Walworth Co., New York.

ZONE HEATING SYSTEMS

Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Webster Talmadge, New York.

Service The *Satisfaction*

VECO SYSTEM of VAPOR HEATING

Write us about the Building you want to heat—any building, regardless of size, character or location. VECO gives the same good service wherever installed.
— WE GUARANTEE IT —

VAPOR ENGINEERING COMPANY

PHILADELPHIA—10 So. 18th Street
J. Wilbur Glassey—M. S. Buck

NEW YORK—489 Fifth Avenue
Chas. E. Scott—R. C. Willis

QUALITY SIMPLICITY

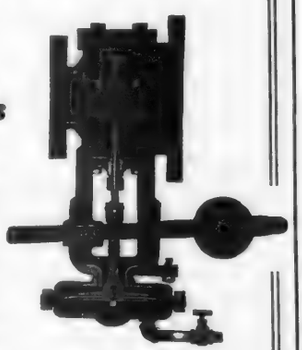
KIELEY

REGISTERED TRADE MARK

PRESSURE CONTROL

for Steam, Water, Air, Gas, Oil Specialties

Fifty years' experience to call upon for the best possible solution of your problems of pressure control, regulation, trapping and other problems is yours when you put your difficulties up to us. Write for the Kieley Book of 226 pages of illustrations and interesting text matter vital to the needs of every engineer. We have a representative near you. Drop us a line today.



Pressure Reducing Valve, balanced type used to reduce High Pressure down to Low Pressure.

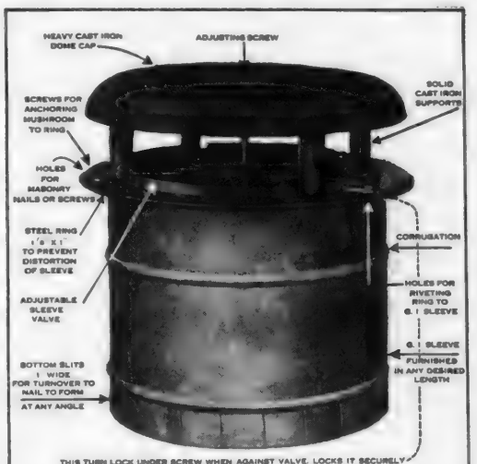
KIELEY & MUELLER, Inc.
34 West 13th St., New York City
Established 1879

for perfect QUIET, install

Rigid locking device prevents rattling. Absolutely fool-proof. Simply turn lock against the valve and it is firmly locked in any position desired. The ONLY mushroom made, the parts of which cannot be separated either before or after installation.

AERO VALVE

MUSHROOM AIR DIFFUSER


HEAVY CAST IRON DOME CAP
ADJUSTING SCREW
SOLID CAST IRON SUPPORTS
SCREWS FOR ANCHORING MUSHROOM TO RING
HOLES FOR MASONRY NAILS OR SCREWS
STEEL RING TO PREVENT DISTORTION OF SLEEVE
CORRUGATION
ADJUSTABLE SLEEVE VALVE
HOLES FOR RIVETING RING TO G. I. SLEEVE
G. I. SLEEVE
FURNISHED IN ANY DESIRED LENGTH
BOTTOM SLITS 1" WIDE FOR TURNOVER TO NAIL TO FORM AT ANY ANGLE
THIS TURN LOCK UNDER SCREW WHEN AGAINST VALVE, LOCKS IT SECURELY

Not only the quietest, but also the strongest mushroom. Made with heavy CAST IRON Dome and Supports. Approved by leading Architects and Engineers. Send for booklet, showing complete specifications.

Knowles Mushroom Ventilator Co.
202 Franklin Street New York City

United States Ozone Company of America

Manufacturers and Engineers
ESTABLISHED 1910

Trade Mark USOZONE Reg. U.S. Pat. Office

Trade Mark USOZONE Reg. U.S. Pat. Office

"United States Ventilating Ozonizers"

Let us send you our Bulletins Nos. 41 and 54 *Factory and Sales Office,* SCOTTDALE, PENNA.

ALPHABETICAL INDEX OF ADVERTISEMENTS

A

Aeolus Dickinson 152
Aerofin Corporation 43
Airmaster Corp. 153
Alberger Heater Co. 152
Alexander Bros., Inc. 162
American Blower Co. 42
American District Steam Co. 45
American Metal Products Corp. 159
American Radiator Co., ... 6, 12, 27, 81, 122, 123
Ames Pump Co. 109
Armstrong Cork & Insulation Co. 121
Armstrong Machine Works 54
Athey Co. 148
Atlas Valve Co. 146

B

Badger & Sons Co., E. B. 51
Baldor Electric Co. 141
Barnes & Jones 150
Bayley Blower Co. 148
Bishop & Babcock Sales Co. 41
Brownell Co. 37
Bryan Steam Corp. 136
Buffalo Forge Co. 30
Burnham Boiler Corp. 140

C

Carrier Engineering Corp. 152
Cashin Co., W. D. 157
Celotex Co. 47
Central Station Steam Co. 151
Century Electric Co. 48
Chace Valve Co., W. M. 152
Cleveland Gas Burner & Appliance Co. 125
Coatesville Boiler Works 117
Connor, W. B., Co. 139
Consolidated Ashcroft Hancock Co., Inc. 140
Crane Co. 124
Crocker-Wheeler Electric Mfg. Co. 138

D

Davis Engineering Corp. 142
Davis Regulator Co., G. M. 145
Detroit Stoker Co. 21
Domestic Stoker Co. 130
Dunham Co., C. A. 34
Duriron Co., The, Inc. 144
Dwyer Equipment Co. 147

E

Electrol, Inc. 24
Emerson Electric Mfg. Co. 149
Excelso Products Corp. 119

F

Farnsworth Co. 148
Fitzgibbons Boiler Co. 5
Flax-li-num Insulating Co. 38
Foster Wheeler Corp. 146
Foxboro Co., Inc. 149
Frank Heater & Engineering Co., Inc., O. E. 150
Frost Mfg. Co. 7
Frost Research Laboratory, Inc. 146
Fulton Sylphon Co. 118

G

G. & O. Mfg. Co. 142
General Gas Light Co. 28
Gorton Heating Corp. 152
Grinnell Co., Inc. 115

H

Hardinge Brothers, Inc. 15
Hartmann Co., Chas. 145
Healy-Ruff Co. 159
Heggie Simplex Boiler Co. 56
Hoffman Specialty Co. ..... Back Cover
Hornung, J. C. 132

I

Illinois Engineering Co. ..... Front Cover
Illinois Malleable Iron Co. 150
Insulite Co. 50
International Boiler Wks. 18

J

Janette Mfg. Co. 29
Jenkins Bros. 46
Johnson Service Co. 126
Johnston Brothers, Inc. 145

K

Kainer & Company 159
Kennedy Valve Mfg. Co. 137
Kewanee Boiler Corp. 3
Kieley & Mueller, Inc. 161
King-Seeley Corp. 135
Knowles Mushroom Ventilator Co. 161

L

Lytton Mfg. Co. 136

M

Marsh & Co., Jas. P. 164
Marsh Valve Co. 40
McAlear Mfg. Co. 17
McDonnell & Miller 44
McIlvaine Burner Corp. 152
McQuay Radiator Corp. ..... 2nd Cover
Mercoid Corp., The 129
Modine Mfg. Co. 32
Monitor Boiler Co. 120
Mueller Co. 13

N

Nash Engineering Co. 110-113
National Air Filter Co. 153
National Pipe Bending Co. 143
National Radiator Corp. 9
National Regulator Co. 153
National Tube Co. 39
Nelson Corp., Herman 19-20
Newport Boiler Co. 146
New York Blower Co. 153
Nu-Way Corp. 55

O

Oil City Boiler Works 148
Orr & Sembower, Inc. 8

P

Pacific Steel Boiler Corp. 4
Page Boiler Co., Wm. H. 14
Patterson-Kelley Co. 139
Peerless Unit Ventilation Co. 155
Penn Electric Switch Co. 28
Powers Regulator Co. 107

R

Ric-wiL Co. 127
Rome Brass Radiator Corp. 128
Rome-Turney Radiator Co. 147
Ross Heater & Mfg. Co. 150

S

Sarco Co. 58
Sheer Co., H. M. 151
Simplex Heating Specialty Co. 157
Skidmore Corp. 143
Skinner Bros. 22
Spang, Chalfant & Co., Inc. 49
Stanwood Corp. 11
Staynew Filter Corp. 130
Sterling Engineering Co. 141
Sturtevant Co., B. F. 113, 131
Swartwout Co. 157

T

Texo Sales Co. 134
Thermal Units Co. 52, 53
Thrush & Co., H. A. 25
Time-O-Stat Controls Co. 133
Titusville Iron Wks. 10
Trane Co. 33

U

U. S. Ozone Co. 161

V

Vapor Engineering Co. 161
Ventilating Products Co. 151

W

Walworth Co. 26
Want Ads 116
Webster & Co., Warren 35
Weil-McLain Co. ..... 3rd Cover
White Mfg. Co. 135
Whitlock Coil Pipe Co. 116
Wing Mfg. Co., L. J. 151
Winslow Boiler & Eng. Co. 16
Wolverine Tube Co. 144
Woodward, Frank E. 159

Y

York Heating and Ventilating Corp. 36
Young Radiator Co. 142

"TENTACULAR"
TRANSMISSION

Patented in 28 Countries
Used All Over the World

For the transmission of power on short centers and high-speed ratios, TENTACULAR will pay for itself in the saving of power over any other system.

No idler, no sheaves or special pulleys.

Simple—Economical—Efficient

Alexander Brothers, Inc.

General Office and Plant: 14 South St., Philadelphia, Pa.

Branches
CHARLOTTE, N. C.
ATLANTA, GA.

Distributors in all Principal Cities

Branches
NEW YORK CITY, N. Y.
CHICAGO, ILL.

"Sole Makers of Tentacular Transmission Belt"

Certified tests for your protection

EVERY Jennings Vacuum Heating Pump is rigidly tested at the factory before shipping. Every Jennings Pump is made to demonstrate that it has the full load air and water capacities for which it is recommended.

This test is conducted for the owner's protection as well as ours. A test report properly certified, states exactly the number of g.p.m. of water and cu. ft. per minute of air that the pump delivered when tested under working conditions of vacuum and pressure. The calibrated orifice can be used to compare other makes of pumps.

The purpose of supplying this material is to enable you to select a pump on a delivered capacity basis . . . the only true basis of comparison. For, by knowing the combined volume of air and water a pump handles, you avoid depending on published ratings which give merely estimated capacities and the amount of radiation for which a pump is recommended.

Bulletin 85 explains the construction and operation of the Jennings Vacuum Heating Pump. Write for a copy.

, , , ,

Jennings Vacuum Heating Pumps are furnished in capacities ranging from 4 to 400 g.p.m. of water and 3 to 171 cu. ft. per min. of air. Either automatically controlled or for continuous operation. For serving from 2,500 to 300,000 sq. ft. equivalent direct radiation.

Jennings Pumps

THE NASH ENGINEERING CO 81 WILSON ROAD, SOUTH NORWALK, CONN.

In Successful Buildings everywhere . . . .

The Villa Riviera, on the Ocean Front at Long Beach, California, is another example of the outstanding buildings —all over the country—for which Marsh Heating Systems have been selected.

Pioneers in the building of heating specialties and systems, Jas. P. Marsh & Co. and its products have won the confidence of the highest Engineering and Architectural authorities—an ever increasing number of whom are specifying Marsh for their most important projects.

Marsh Heating Systems

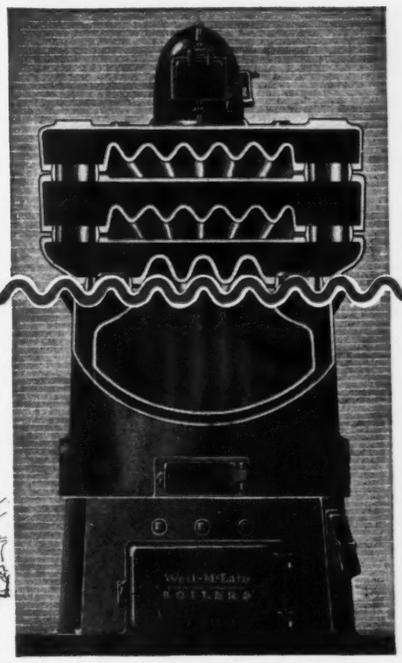
No matter how efficiently a boiler may *make* heat, the heating plant can't be economical *unless the heat is properly controlled*. By providing this needed control Marsh Systems insure most effective use being made of the heat generated by the boiler.

For 64 Years—Makers of Good Heating Specialties

JAS. P. MARSH & CO.

2073 Southport Avenue, CHICAGO
551—5th Avenue, NEW YORK CITY
Bond Building, WASHINGTON, D. C.
Other Offices in Principal Cities

Villa Riviera, Long Beach, Cal. Marsh Vacuum Heating System installed by H. I. Stiller & Co. Richard D. King, Architect. Kinne & Westerhouse, Engineers and Builders.



These corrugations
add 30% to 40% more heating surface

They mean fewer tons of coal or coke . . . fewer gallons of oil consumed

Doubtless you have often seen, in Weil-McLain Boiler advertising, a wavy line like this~~~~~~~.

But have you thought how such a wavy line, as compared with a straight line like this———, crowds perhaps one-third more lineal surface into a given space?

This wavy line illustrates very clearly the corrugation principle, as applied in the Weil-McLain Round Boiler. In much the same way, the vital heat-absorbing surfaces in this famous boiler are corrugated like this~~~~~~~, instead of flat like this———.

Thus, in Weil-McLain Round Boilers, more heat-absorbing surface is crowded into a boiler of the same size. And as a final result, fewer tons of coal or coke, or fewer gallons of oil are required to heat a home.

But you will find other reasons why this famous boiler gives more heat and saves fuel. For example, in its long, balanced back-and-forth fire travel, the hot gases are baffled backward and forward through the corrugated heat-absorbing surfaces. There are no short cuts to the chimney, under *any* conditions. A final safeguard against chimney waste!

There are Weil-McLain Boilers to meet all conditions . . . Round Type, Jacketed, Self-feed, Square, and Smokeless. Also Weil-McLain Radiators.

They look alike, but *are* they?

Be wise . . . analyze!

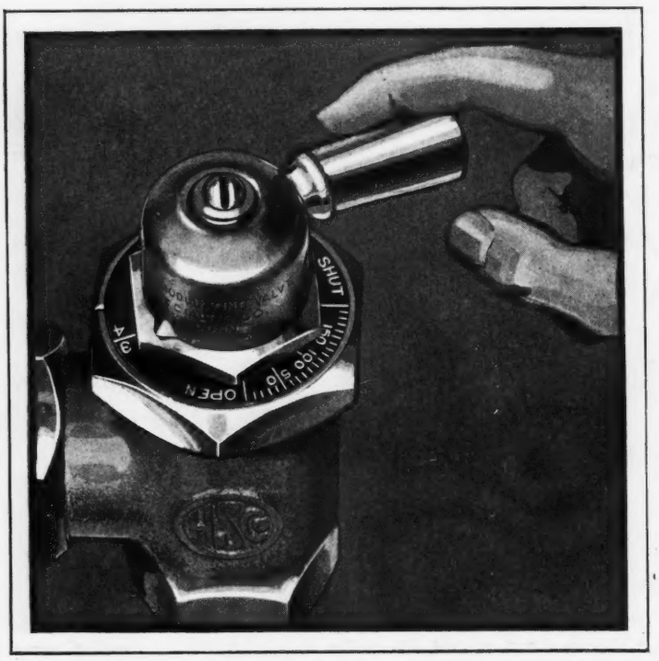
The Weil-McLain Line of Boilers has many sales features that remain hidden under casual or indifferent examination. Analyze these features. They will surely help you close jobs—at a profit.

WEIL-McLAIN COMPANY
General Offices: Chicago, Illinois
Boiler Factory: Michigan City, Indiana
Radiator Factory: Erie, Pa.

Weil-McLain
SCIENTIFIC COMBUSTION
BOILERS

© 1929, W-McL

With a Wrench in a minute



You can adjust this griefless radiator modulating valve with steam pressure on.

Stop trying to lick pressure differentials on vapor and vacuum jobs, with valves that cannot be adjusted to suit individual conditions.

Try just one job with Hoffman No. 7 Modulating Valves. After that you'll never use any other kind.

Why? Because with these valves you can balance up the system in jigtime so that every radiator, regardless of size, regardless of distance from the boiler,—heats quickly and evenly.

You know what that means, especially on oil or gas fired jobs. No worrying about pressure drops. Far off radiators heat just as quickly and efficiently as do those a few feet from the boiler.

If the owner wants certain radiators (in living rooms, sun-porches, etc.) favored, it's a cinch with No. 7 Valves.

The secret lies in the patented externally adjusted sleeve of the Hoffman No. 7 Modulating Valve. This sleeve enables you to establish a port area that supplies just the right amount of steam for each radiator. Loosen the lock nut, set the dial, tighten the nut. The job's done, and you have a distribution of heat to suit the crankiest customer.

And don't forget that *these* valves can be adjusted *with steam on* and you do not have to break any connections. Ask your jobber about them today. You'll find they cost a little more to buy, but less in the end. Don't forget the time they save and the grief they do away with after the job is in. Hoffman Specialty Company, Inc., Dept. C-53, Waterbury, Connecticut.

HOFFMAN CONTROLLED HEAT